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HAMILTON TRANSIT STUDY

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HAMILTON TRANSIT STUDY

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Working Papers

WORKING
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HAMILTON TRANSIT STUDY

PHASE II

Working Paper No.1

THE BUS PASSENGER SURVEY

This paper describes the procedures used in the Bus Passenger Survey of November 23, 1972, to collect and tabulate origin-destination data.

The buses and trolley buses of the Hamilton Street Railway have been operating for many years and their operations have been subject to a continuing review and updating process with routes and schedules being improved as necessary during the course of each year. The major sources of information upon which to base improvements have always been fare box counts, peak load counts and passenger complaints, combined within a thorough knowledge of major trip attractors and an awareness of the process of growth and change. These input data are generally quite adequate for day-to-day operation and systematic improvements to routing and scheduling.

Periodically, however, it is valuable to explore passenger demands in greater depth. More specific investigations can be done in various ways, and one useful method is to examine user characteristics by asking the passengers detailed questions about themselves and their travel requirements. This is what was done in the passenger survey.

The purpose of the bus passenger survey was to augment the available information on bus passenger volumes with more detailed information on the origins to destinations of passengers, their trip purpose and transfer movements. This type of information has not previously been available in Hamilton and it gives a useful basis from which to test the probable effects of changes in routes and schedule.

For Hamilton, all the required data was collected on a single typical day. Data collection on this scale (90,000 daily bus trips) sometimes makes use of a relatively small sample. However, our previous experience has shown that a large sample is required to support the types of detailed analyses proposed. In this case it was decided to contact as many as possible of the passengers using the system on the survey day. Assuming that each passenger makes two trips, one forward and one return, a complete sample would contact 45,000 passengers representating the 90,000 daily trips on the system. This level of contact is reached by surveying each route in one direction for the whole survey period. The technique used in Hamilton was a self-applied questionnaire with a pre-paid mailback which produced a return of nearly 30% (i.e. a large sample of the people travelling). The returned sample was expanded to represent the total trips on the system without significant loss of definition.

QUESTIONNAIRE

In order to permit analysis of trip routing, coverage, scheduling and transferring as well as providing background information on peoples' major wishes and desires, the survey contained nine questions on trip origins and destinations, purpose, transfer, return trips and important features. To facilitate handling, the size of the questionnaire and the number of questions were limited to a folded card, 6½" x 7½". The return portion was then suitable for filing and storing in the same manner as standard computer cards. Exhibit 1 shows the survey card used in Hamilton.

Of the nine questions put to the passengers, three were concerned with geographic information, one was concerned with time, one with transfer information, one with purpose and one with the return trip. In addition, the opening question was a general one to indicate the frequency of usage and the last question asked for opinion-type information.

As shown on Exhibit 1 , question 1 simply asked the passenger if he or she was a daily user. Question 2 asked for information on home address which was used to interpret the responses to the origin and destination questions (No's 4 and 5). Question 3 asked the passenger to indicate his boarding time on the journey in which he received the card. This information was checked with the driver record of card handouts using the survey number printed on every card. Question 6 asked the passenger to indicate if he used a transfer and what transfer route and transfer point this involved. Question 7 asked trip purpose. Question 8 asked for information on the reverse trip, i.e., any trip made in the opposite direction to the trip being surveyed. Question 9 asked the passenger to provide information on features of the bus service that he would like to see improved.

PILOT SURVEY

In order to test the card format and the procedures for driver application of the survey, a pilot study was carried out on Wednesday, November 1, 1972. Some 5,000 cards were printed and distributed to nine vehicles operating on four different routes. The returns were tabulated to indicate where the survey had been misunderstood or where the driver instructions had not been adequately followed.

The pilot survey indicated that the survey format and the driver instructions were adequate for their purposes and the full survey proceeded three weeks later with only minor modifications in technique.

SURVEY APPLICATION

The full survey was carried out on Thursday, November 23, 1972 which proved to be a fairly typical day on the transit system. On the

Monday, Tuesday and Wednesday prior to the survey, information slips were placed near the front door of all buses to advise the public of the survey date and purpose. A "show" card was also placed in each bus to draw attention to the survey.

Route maps and instructions were prepared for each driver showing in which direction the survey should be applied and how it should be carried out. In addition, each driver was paid to attend one of four training sessions at which the survey procedure was explained in detail. A box of survey cards with appropriate instructions was made up for every vehicle scheduled out of the garage on the survey day. Extra cards were available to any driver needing them through the mobile inspectors and the dispatcher.

Every passenger boarding a bus in the survey direction and paying a fare was handed a survey card to be filled in and returned by pre-paid mail to a Hamilton Postal Box. Approximately 47,000 cards were handed out to passengers over the survey period from 4:00 a.m. Thursday to 2:00 a.m. Friday. During the course of the survey the drivers kept a close tally of the card numbers handed out on each run and this information was used to check the passenger responses during the coding process. Of the cards returned, the majority were mailed in during the three weeks following the survey.

CODING

All incoming cards were sorted by serial number and identified according to the route and bus on which they were distributed. The coding was then carried out systematically by routes.

The origin and destination data were coded to the neighbourhoods contained in the Hamilton zoning bylaw, except that certain of these

neighbourhoods were subdivided to smaller transit zones. Beyond the City of Hamilton, data were coded to the zones of the Hamilton Transportation Study. All times were coded to the 24-hour clock. Where time was not given on the return trip question, a code of 2500 was used. The 28 routes in Hamilton were coded according to their route numbers in the range from 1 to 61, except that when a transfer route was not stated and could not be inferred, the trip was coded as Route 66.

EDITING AND EXPANSION

When the interview data had been coded, it was key punched and compiled on magnetic discs. Later phases of the analysis reformatted the trip records and modified and expanded them to provide the data deck used for tabulation. Before this transformation, several editing routines were applied to test the data for consistency, and to be sure that the coded information was complete and fell within the appropriate ranges.

After the editing, the records were tabulated by route and by hour and compared with the handout information from the driver control sheets. Expansion factors were calculated by dividing the return into the handout for each route and hour. In cases where the return for a given hour was less than 15, then two or more hours were combined and the expansion factor re-calculated. This process avoided extreme variations in the expansion factors.

The neighbourhood codes, neighbourhood sub-zones and groups of external traffic zones were systematically renumbered to convert all data to a simple geographical set of 230 transit zones. Groupings of these transit zones into 72 districts and 21 sectors were established for use in general tabulations.

The reverse trip information was extracted from the survey records and used with the origin and destination information to provide separate records of the reverse trips.

The process yielded some 20,000 separate trip records which were expanded to 87,000 trips and gave a good approximation of the daily travel on the HSR system.

TABULATION

Most of the tabulations prepared from the trip data were simple cross tabulations of two pieces of information from the survey records. For some of the cross tabulations only a segment of the total trip deck (e.g., work trips or transfer trips) were analyzed.

Origin-destination trip tables were prepared on the basis of sectors, districts and zones. Some listings were developed in which five items of data were sorted and tabulated simultaneously. An index of the computer tabulations and maps of the zones and districts are contained in the Appendix of this report. A complete set of tabulations has been supplied to the Hamilton Street Railway.

Exhibit 2 is a copy of Tabulation M, "All trips by origin district and destination district". Exhibit 3 is a district map attached for reference purposes. Because of their volume, zone-to-zone tables are only suitable for detailed analysis.

DISCUSSION OF RESULTS

Total Expanded Trips

The returns, representing trips in the survey direction, expanded to a total of 47,600. Trips in the non-survey direction expanded with the

same expansion factors totalled 39,200. In total, the expanded results represented 86,800 trips on the system. The major component not represented in the survey, is the one-way trips occurring in the non-survey direction. This is one reason for a difference between the expanded survey total and the actual fare box estimate of 89,700 on November 23.

Passenger Trips by Route

Of the total expanded trips some 15,900 (approximately 18%) were credited to the group of routes designated as Route 5 including the Delaware, West Hamilton, Main West and University routes. The other large volume routes, the Barton and King trolley routes, served 11,400 and 9,400 (13% and 11% of the total) respectively, according to the survey results.

The survey results indicate a higher level of transferring than the actual count of transfers collected on the survey day. There are several reasons for this:

- The survey recognizes transfer trips in passes (e.g., senior citizens passes) for which no actual transfers are collected.
- The survey credits transfer trips to the Dundas route where passengers actually pay an additional fare.
- Some respondents seem to claim a transfer for a short trip extension when, in practice, they usually walk the last few blocks.
- Some passengers may not surrender their transfer in anticipation of using it for an extra trip.

- Persons requiring transfers had a stronger incentive to return the survey card (i.e. the most potential interest in improvements).
- The survey process credits transfer movements to the "originating" route while the H.S.R. statistics credit transfers to the route on which the drivers collect them. This difference in definition produces some anomalies in the comparison.

Trip Purpose

Just under half of the total reported trips were designated as work trips.

Shopping trips, school trips and personal business trips were about equally represented in the remainder.

Trips by Time Period

Tabulation of the data by time period shows that approximately 16,000 (18%) of the daily trips occur during a two-hour morning period from 7:00 a.m. to 9:00 a.m. The afternoon period from 3:00 p.m. to 5:00 p.m. accounts for some 21,000 trips (23% of total). The period from 4:00 p.m. to 6:00 p.m. accounts for slightly fewer trips than the 3:00 to 5:00 p.m. period, reflecting the industrial shift changes in Hamilton which coincide with the school and shopping peaks, and occur earlier than the work peak experienced in other cities.

Origins and Destinations by Transit Zone

Exhibit 4 gives a graphical representation of the distribution of bus trip origins on a daily basis.

Tabulation of the origin-destination information from the survey shows that the CBD and adjacent zones are by far the greatest attractors of transit trips. The second most important area is McMaster University with some 3,000 daily attractions. The Greater Hamilton Shopping Centre accounts for some 2,200 daily attractions.

In spite of a high concentration of job opportunities, the industrial area along Burlington Street accounts for only 1,800 daily attractions showing a relatively low ridership amongst the industrial workers.

On the Mountain, the most active zone is near the intersection of Upper Sherman and Concession Street. The Henderson Hospital combines with both commercial and residential uses to attract some 1,000 trips daily.

The importance of the Fennell campus of Mohawk College is indicated by some 800-trip attractions.

The series of zones along Concession Street aggregate 3,000 trip ends, a much greater concentration of trips than is evident anywhere else on the Mountain.

Features of Service

The last question on the survey, asked respondents to indicate which features of service they would most like to see improved. Most often mentioned amongst the responses were frequency of service and bus shelters. Together these two items accounted for 39% of the total responses. Improvements to weekend and evening service were mentioned in a further 22% of the responses.

Other Tabulations

The listings by route and transfer point were used as a basis for analyzing various problem situations and improvement proposals in more detail.

Permanent Record

On completion of the tabulation work all trip records were transferred from magnetic disc to tape for a permanent record. While all pertinent information is contained in printed tabulations, the tape will allow further computer analysis or other cross references to be undertaken.

The tape is held by the Hamilton Street Railway Company.

The key to the magnetic tape is given in the Appendix.

APPENDIX

BUS PASSENGER SURVEY

List of Tabulations

<u>Ref.</u>	<u>Description</u>
	List of Expansion Factors by Hour and Route
A	Trips in the survey direction by route and time period Trips in the non-survey direction by route and time period
B	All trips by route and time period
C	Service features needing improvement by route and by feature
D	Needed improvements by origin district and feature
E	Needed improvements by home neighbourhood and feature
F	All trips by origin sector and destination sector
G	All trips by destination district and time period
H	All trips by time period and purpose
J	Work trips by origin district and time period
K	Work trips by destination district and time period
L	All trips by origin district and time period
M	All trips by origin district and destination district
N	All trips by origin zone and destination zone
P	7:00-9:00 a.m. trips by origin zone and destination zone
R	All trips listed by route, origin zone, destination zone, transfer route, transfer location and purpose
S	Transfer trips by route, transfer route, time period, transfer location and purpose
U	Transfer trips by transfer location, origin district, destination district, origin route and destination route

MAGNETIC TAPE KEY

This volume has standard OS/360 tape header and trailer labels.

1 (one) 80 byte label record - SER = HLTNTS

<u>File</u>	<u>Dataset Name</u>
1	HLTNTS.FWD.TRIPS (Forward trips)
2	HLTNTS.FWD.REV.TRIPS (Forward & Reverse trips)

<u>DCB Data</u>	<u>Dataset</u>
DCB = (RECFM=FB,LRECL=73,BLKSIZE=7300)	HLTNTS.FWD.TRIPS
DCB = (RECFM=FB,LRECL=80,BLKSIZE=7200)	HLTNTS.FWD.REV.TRIPS

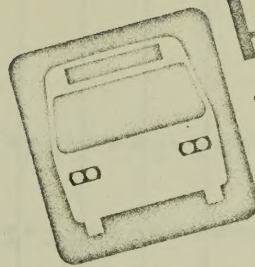
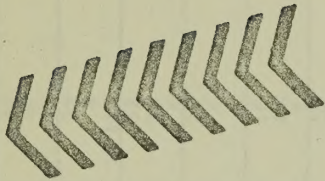
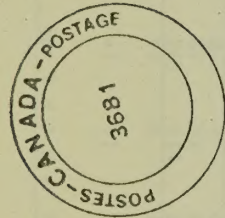
RECORD LAYOUT FOR DATASET "HLTNTS.FWD.TRIPS"

Col.No.

2	Use Bus Daily
4-6	Origin Zone
7-10	Start Time
12-14	Destination Zone
16	Transfer
17-18	Transfer Route
19-20	Transfer Point
22	Purpose
24	Reverse Trip
26-29	Reverse Trip Time
31-32	Route
34-35	Key
36	Terminal
37-38	Time Period
39-43	Expansion Factor
45-55	Features of Service
45	Walking Distance
46	Frequency
47	Speed
48	Shelters
49	Transfers
50	Weekend
51	Evening
52	Extensions
53	Courtesy
54	Cleanliness
55	Other
56-57	Origin District
58-59	Destination District
60	Home Origin
64-67	Home Zone
68	Home Destination
70-71	Origin Sector
72-73	Destination Sector

RECORD LAYOUT FOR DATASET "HLTNTS.FWD.REV.TRIPS"

<u>Col. No.</u>	<u>Data</u>
2-7	Trip Sequence Number
9	Use Bus Daily
11-13	Origin Zone
14-17	Start Time
19-21	Destination Zone
23-	Transfer
24-25	Transfer Route
26-27	Transfer Point
29	Purpose
31	Reverse Trip
33-36	Reverse Trip Time
38-39	Route
41-42	Key
43	Terminal
44-45	Time Period
46-50	Expansion Factor
52-62	Features of Service
52	Walking Distance
53	Frequency
54	Speed
55	Shelters
56	Transfers
57	Weekend
58	Evening
59	Extensions
60	Courtesy
61	Cleanliness
62	Other
63-64	Origin District
65-66	Destination District
67	Home Origin
71-74	Home Zone
75	Home Destination
77-78	Origin Sector
79-80	Destination Sector



HAMILTON TRANSIT STUDY

Hamilton Transit Study BUS PASSENGER SURVEY

- Please help us to help you !
- Answer questions 1 to 7

.... FOR THE TRIP
ON WHICH YOU WERE GIVEN
THIS CARD

- Answer question 8 for your reverse trip and

.... DO NOT ACCEPT
A SECOND CARD
FOR THE REVERSE TRIP

- Mail your answers back today (FREE!)
- We invite you to expand your answers to question 9 OR make further comments and suggestions, by writing to:

Hamilton Transit Study
P.O. Box 1029
HAMILTON, Ontario

Survey No 72263

- Do you use the bus daily?
Yes ☐ No ☐
- What is your home address?

- At what time did you get on this bus?
_____ a.m. _____ p.m.
- Where did you start this trip?
From home? Yes ☐ No ☐
If NO please give address, building name or nearest street corner from which you started.

- Where are you going?
To home? Yes ☐ No ☐
If NO please give address, building name or nearest street corner to which you are going.

- Do you have to transfer to reach your destination? Yes ☐ No ☐
To what route(s) will you transfer?

At what street corner will you transfer?

- Why are you making this trip? (Check one)
Work ☐ Shopping ☐ School ☐
Personal Business ☐
- Will you, or did you, make the reverse trip by bus today? Yes ☐ No ☐
At what time?
_____ a.m. _____ p.m.
- Please check (✓) the THREE features of bus service which you would most like to see improved.
walking distance to bus stop ☐
frequency ☐ speed of travel ☐ bus shelters ☐
transfers ☐ weekend service ☐ evening service ☐
route extensions ☐ courtesy ☐ cleanliness ☐
other (specify) _____

OFFICE USE
ONLY

DETACH HERE



ORIGIN - DESTINATION BY DISTRICT

*** ALL TRIPS ***

ORIGIN (DISTRICT)

DESTINATION (DISTRICT)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

2	0	127	391	11	0	53	14	166	168	7	430	191	21	0	34
3	0	313	123	29	0	188	206	170	322	37	603	277	53	116	138
4	0	0	23	4	0	25	28	87	75	3	104	38	13	10	22
5	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
6	0	50	153	25	0	49	59	270	19	14	203	31	3	3	15
7	0	18	167	28	0	65	67	292	57	3	300	92	4	17	10
8	0	145	163	86	0	241	269	3	183	3	36	42	15	177	70
9	0	153	294	74	0	19	61	167	68	46	262	28	20	54	39
10	0	7	32	0	0	11	8	6	30	0	8	9	0	8	8
11	0	391	531	78	4	159	269	27	243	8	50	86	38	138	111
12	0	180	280	38	0	32	95	54	25	0	96	30	18	13	52
13	0	25	55	7	0	0	2	19	27	0	45	11	4	5	30
14	0	0	105	16	0	3	9	134	35	8	124	11	5	9	4
15	0	31	132	22	0	18	10	77	39	8	115	64	30	8	28
16	0	90	167	22	0	44	145	141	183	43	478	85	69	66	9
17	0	17	64	26	0	17	20	47	51	5	156	68	10	9	6
18	0	89	157	59	0	61	121	93	93	18	415	133	48	45	18
19	0	14	32	4	0	45	29	69	21	3	70	2	11	29	15
20	0	0	9	4	0	0	5	0	15	0	9	0	0	0	3
21	0	28	63	13	0	5	43	46	53	0	153	53	0	3	10
22	0	41	88	22	0	65	50	120	68	31	426	98	27	12	18
23	0	0	48	0	0	7	9	14	40	3	110	39	8	4	4
24	0	21	99	19	0	49	27	95	15	6	334	47	47	3	11
25	0	12	12	5	0	5	15	38	15	3	77	20	12	22	5
26	0	22	21	14	0	37	34	35	56	20	18	19	0	50	8
27	0	35	112	20	5	13	3	97	42	5	387	63	13	9	28
28	0	58	182	32	0	26	62	173	112	17	805	114	56	89	19
29	0	0	17	3	0	4	10	25	28	6	56	5	5	24	7
30	0	6	18	0	0	19	9	6	6	18	0	6	0	11	0
31	0	24	54	8	0	0	4	26	29	0	96	23	2	8	5
32	0	26	136	33	0	17	26	140	81	40	650	89	69	43	6
33	0	9	74	4	0	5	9	39	21	10	141	31	2	0	22
34	0	4	18	0	0	3	0	36	21	2	99	25	0	3	7
35	0	16	26	5	0	0	0	25	40	0	78	31	6	0	10
36	0	16	16	0	0	0	10	17	17	0	70	7	11	5	9
37	0	2	0	0	0	0	3	7	2	8	82	7	0	3	3
38	0	0	23	0	0	0	11	3	3	0	18	3	0	0	0
39	0	8	20	0	0	0	3	20	17	2	147	10	2	4	6
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	195	40	0	0	29	12	235	61	17	573	175	35	9	19
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	2237	4939	913	5	1506	1981	4048	2882	439	10923	3124	797	1111	1034

ORIGIN - DESTINATION BY DISTRICT

ORIGIN (DISTRICT)

DESTINATION (DISTRICT)

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
2	86	17	81	14	0	33	34	0	24	12	22	35	47	0
3	150	68	139	34	9	49	85	48	103	12	21	103	165	17
4	22	26	53	6	4	13	24	0	10	5	14	22	3	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	48	15	36	53	0	5	70	7	49	5	32	13	29	4
7	123	24	86	29	5	32	32	3	30	17	37	3	56	9
8	136	41	89	78	0	46	103	18	95	43	35	87	146	25
9	161	40	81	24	21	46	53	12	13	15	78	40	109	28
10	43	5	18	3	0	0	19	3	14	3	20	5	17	0
11	352	131	362	74	6	156	343	111	309	74	13	355	732	51
12	72	58	106	2	0	33	95	36	50	24	19	61	108	5
13	69	10	32	11	0	0	21	5	44	6	0	13	54	5
14	49	9	39	29	0	0	15	4	22	45	16	90	24	11
15	15	6	24	15	13	10	18	4	11	5	8	29	22	7
16	50	27	90	21	3	5	216	17	98	16	15	88	254	34
17	30	11	6	6	4	10	21	5	5	17	4	35	0	6
18	103	8	52	6	0	17	51	11	68	17	29	41	193	10
19	21	3	13	0	0	7	35	4	3	5	13	29	88	35
20	3	4	0	0	0	4	0	3	0	0	0	8	5	0
21	5	13	14	7	4	0	3	6	15	3	14	18	34	3
22	232	27	63	46	0	9	0	2	8	10	7	35	157	16
23	21	10	14	4	3	6	0	0	0	7	5	15	15	20
24	111	5	83	3	0	11	24	0	0	8	15	61	105	11
25	16	8	17	5	0	3	10	7	4	0	11	12	54	12
26	15	17	29	13	0	14	7	5	15	0	0	90	114	9
27	80	7	44	32	8	21	53	15	73	20	101	19	188	33
28	321	35	205	86	5	34	185	11	135	56	120	146	221	24
29	34	0	13	39	0	0	16	20	13	15	14	27	24	3
30	6	6	0	0	0	5	0	0	0	3	0	18	18	0
31	44	0	6	5	7	8	6	17	45	12	18	37	53	2
32	193	29	145	44	16	13	122	3	111	56	113	60	569	96
33	25	11	11	9	0	7	8	0	9	9	25	19	56	11
34	24	5	13	12	0	0	8	6	13	9	3	13	62	2
35	19	2	11	11	0	6	6	4	5	8	29	18	45	7
36	40	8	16	13	2	0	31	0	12	0	13	21	37	0
37	16	0	14	8	0	0	4	0	12	3	0	108	67	3
38	0	0	0	0	0	9	4	0	0	3	3	6	3	0
39	30	9	58	0	4	4	17	0	17	11	4	13	63	5
40	6	4	3	0	0	3	6	6	0	0	0	0	12	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	88	14	25	28	5	2	19	10	29	42	93	28	142	56
54	7	4	17	4	0	0	2	0	3	11	8	0	17	0
55	3	4	3	0	0	0	0	0	0	0	0	0	2	0
56	179	29	90	28	4	34	74	11	38	48	51	28	182	57
57	70	2	38	7	0	26	22	0	0	11	15	0	12	21
58	0	4	3	0	0	4	0	0	2	2	0	0	12	0
59	0	4	3	0	0	4	0	0	0	0	0	0	12	0
60	0	15	158	44	5	53	31	9	41	26	93	13	156	17
61	206	5	17	7	0	3	21	4	16	0	18	3	15	5
62	66	3	16	0	0	0	13	0	11	0	0	0	6	0
63	14	0	0	2	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	105	26	97	17	5	8	51	25	58	8	18	48	86	26
66	17	0	38	18	0	10	15	0	19	2	17	2	31	21
67	2	0	2	3	0	0	0	0	0	0	0	0	0	0
68	73	11	43	5	0	19	29	2	9	8	30	18	32	9
69	0	0	9	0	0	0	0	0	0	0	0	0	0	0
70	14	0	12	0	2	79	0	3	4	6	11	6	10	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	18	4	51	14	0	2	6	8	13	11	2	0	23	4

TOTAL 3644 820 2735 908 135 864 2030 465 1665 694 1269 1824 4800 731 224

ORIGIN - DESTINATION BY DISTRICT

ORIGIN (DISTRICT)	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
2	27	18	5	4	16	16	2	0	0	8	0	0	0	0	0
3	58	115	74	18	35	17	0	0	42	22	0	0	0	0	0
4	3	31	4	0	5	0	0	0	0	0	0	0	2	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	17	5	3	0	0	0	0	0	0	0	0	0	0	0
7	4	28	9	0	0	10	3	0	11	16	3	0	0	0	0
8	26	133	39	32	25	17	7	0	3	17	0	0	0	0	0
9	26	71	21	9	24	17	3	0	3	0	0	0	0	0	0
10	0	40	10	2	0	0	8	0	0	2	0	0	0	0	0
11	90	559	125	88	71	50	81	0	6	131	2	0	3	0	0
12	23	86	25	21	35	7	8	0	3	3	0	0	0	0	0
13	2	61	6	0	6	8	0	0	0	4	0	0	0	0	0
14	5	42	0	0	0	5	3	0	0	0	0	4	0	0	0
15	3	6	14	4	10	9	3	0	0	6	0	0	0	0	0
16	41	175	25	34	12	40	16	0	6	30	4	0	0	0	0
17	0	31	11	0	2	8	0	0	0	9	0	0	0	0	0
18	6	123	11	19	11	16	14	0	0	48	3	0	0	0	0
19	11	38	9	12	0	13	8	0	0	0	0	0	0	0	0
20	7	16	0	0	0	2	0	0	0	4	0	0	0	0	0
21	10	18	7	0	6	0	0	0	9	4	3	0	0	0	0
22	6	94	8	8	6	26	4	0	0	15	6	0	0	0	0
23	17	3	0	0	4	0	0	0	0	0	0	0	0	0	0
24	45	95	18	11	5	12	10	0	0	9	6	0	0	0	0
25	12	45	13	0	8	0	3	0	0	5	0	0	0	0	0
26	9	100	17	3	29	13	0	0	3	4	0	0	0	0	0
27	26	54	19	8	18	21	103	0	6	10	0	0	0	0	0
28	39	447	48	50	40	34	47	0	0	63	12	0	0	0	0
29	2	71	11	2	3	0	3	0	5	4	0	0	0	0	0
30	0	7	5	3	3	0	0	0	5	2	0	0	0	0	0
31	0	21	4	7	11	13	4	0	5	10	0	0	0	0	0
32	19	111	19	84	27	130	2	0	3	50	4	0	0	0	0
33	4	6	5	9	50	2	0	0	0	0	3	0	0	0	0
34	10	75	7	12	68	30	4	0	5	32	7	0	0	0	0
35	7	38	73	66	0	50	12	0	14	47	5	0	0	0	0
36	15	130	2	28	47	14	4	0	0	6	0	0	5	0	0
37	4	2	0	4	12	4	0	0	4	6	0	0	0	0	0
38	0	3	0	5	14	3	4	0	0	0	0	0	0	0	0
39	20	53	0	20	50	10	0	0	6	41	0	0	0	0	0
40	6	4	3	7	5	0	0	0	0	6	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	73	36	12	8	0	7	9	0	8	9	0	0	0	0	0
55	17	4	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	2	0	0	0	0	0	7	0	0	0	0	0
58	51	54	2	15	9	13	0	0	0	6	5	0	0	0	0
59	0	8	0	0	0	2	0	0	0	0	0	0	0	0	0
60	0	2	0	4	0	0	0	0	0	4	8	0	0	0	0
61	14	78	12	8	8	0	0	0	0	5	0	0	0	0	0
62	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	13	80	23	21	13	8	0	0	23	0	3	0	0	6	0
66	0	23	0	5	0	6	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
69	4	11	11	0	0	9	0	0	4	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	4	0	0	0	0	0	0	3	0	0	0	0	0	0
72	0	3	0	0	0	17	61	0	0	0	0	0	0	0	0
TOTAL	760	3279	712	656	688	665	431	0	177	659	91	4	10	6	0

*** ALL TRIPS ***

ORIGIN - DESTINATION BY DISTRICT

ORIGIN
(DISTRICT)

DESTINATION (DISTRICT)

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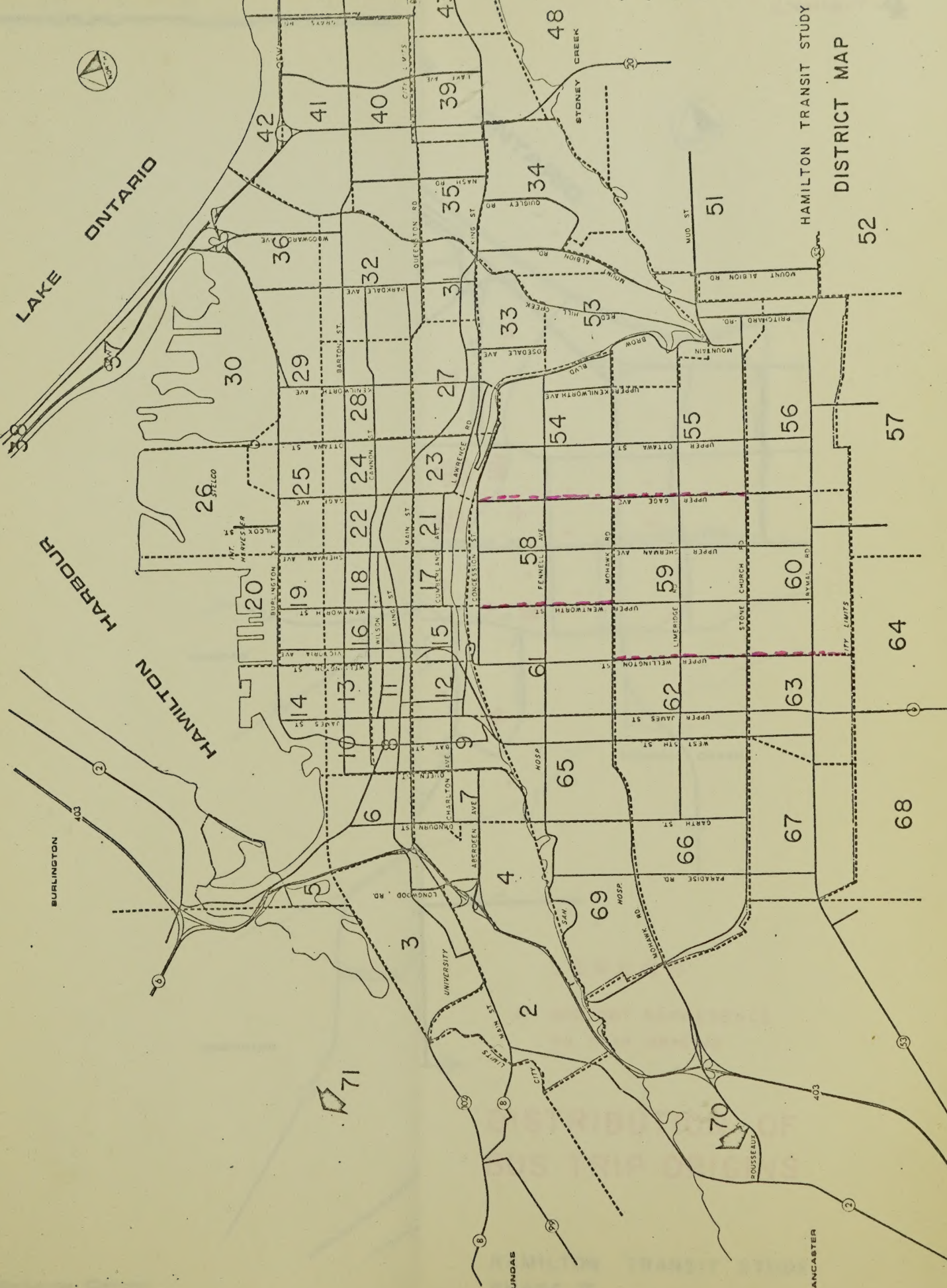
EXHIBIT 2 (CONT'D)

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HAMILTON TRANSIT STUDY
DISTRICT MAP

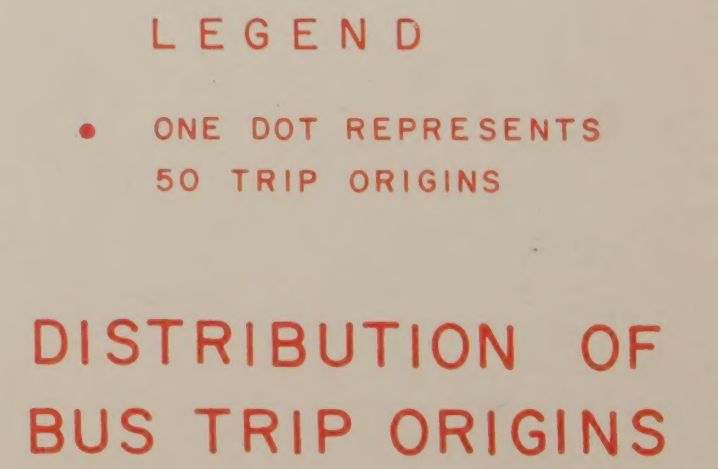
ANCASTER

DUNDAS

BURLINGTON

LAKE ONTARIO

HAMILTON HARBOUR



HAMILTON TRANSIT STUDY

PHASE II

Working Paper No.2

TRANSFERRING

INTRODUCTION

Although a substantial number of transfers occur daily on the HSR system, there are only a very few locations where transfer elimination is feasible. At most locations where transfers occur, the route changes which would remove transfers would also prove detrimental to the passengers now enjoying direct service.

Some further linking-up of routes in the Downtown area would help to reduce the large concentration of transfers.

The second largest concentration of transfers in the Ottawa-Kenilworth corridor could only be reduced by route diversions which would have to be warranted in terms of significant operational improvements. That is, reasons other than the transfer volumes would be required to justify changes.

The response from the bus passenger survey indicated that present passengers are less concerned about transfers than may have been expected. A question on the survey asked what features of bus service the user would most like to see improved. Transfers attracted less attention than any of the other nine features listed. Only 4 percent of the total response indicated a need to improve transfers.

Although the present riders do not appear to perceive a problem in transfers per se, several of the items which did attract attention (e.g. service frequency and bus shelters) seemed to cause special concern at

transfer points. Thus, any reduction in total transfers would help to alleviate these other problems and improve service. In addition, the elimination of transfers would help to attract new passengers who are not prepared to transfer, or are particularly discouraged when there is a need to make more than one transfer to complete a journey.

Of the daily passenger volumes of 85,000 to 90,000 some 25,000 to 30,000 make transfers. Any reduction which can be made in the transfer volumes would reduce travel times for the passengers affected. Non-transferring passengers would also benefit from service speed-up. Any change which serves the present passengers would incidentally be of interest to prospective new passengers especially where the need to make more than one transfer acts as a deterrent to new passengers.

Analysis of the data from the bus passenger survey shows that the major scope for transfer reduction is in the CBD and the East End.

Through the CBD there is scope to extend the Barton trolley route to a terminal in West Hamilton. There is also a possibility of linking up other routes which now terminate at Gore Park. The more intensive use of the Claremont Access would offer some possibility of reducing transfers in the CBD as well as relocating some of the transfer movements to points east of Downtown.

In the East End there is scope to extend the King and Barton trolley routes to a terminal in the vicinity of Eastgate Shopping Centre. Other possibilities include extension of the Delaware route to Eastgate and into the Vincent area via the proposed Greenhill Avenue extension.

Several of these proposals involve the extension of electrification

for the trolley routes and will take a number of years to accomplish. The Delaware extension into the Vincent area can not be done until the Greenhill Avenue is connected across the Red Hill Creek. Accordingly, short-term proposals have been developed for more immediate implementation in the East End. All of the recommendations are discussed in more detail in the sections of the report dealing with service in the East End, on the Mountain, and through the central area.

The following sections provide a description of the major transfer locations, the scale of transfer movements and the opportunities to reduce transferring.

MAJOR TRANSFER POINTS

The locations of major transfer movements are shown in Exhibit 1 and listed in Table 1. The survey indicates that some 30,000 transfers occur daily on the system. This figure includes a number of transfer trips which make use of passes or extra fares and are, therefore, not included in the HSR tabulation of transfers collected. Of the total transfers which occur some 65 percent take place in the Downtown area where 20 of the 29 HSR routes converge. The great majority of the transfer movements in downtown Hamilton occur around Gore Park, however, significant movements also occur along Main Street at the library, John Street and James Street. These latter transfers are intimately related to those at Gore Park since the one-way street system causes people to make transfers on forward and return trips at different points in the system.

The second major transfer area occurs along Ottawa Street and Kenilworth Avenue where the Fennell and Bay Front routes serving the industrial area intersect the major east-west routes. Moderately heavy

TABLE 1

RANKING OF TRANSFER LOCATIONS BY DAILY USE

<u>Ref.</u>	<u>Location</u>	<u>Daily Transfers *</u>
26	Gore Park	17,700
27	James and Main	2,100
70	Barton and Kenilworth	1,300
30	John and Main	1,100
68	Main and Kenilworth	800
67	Main and Ottawa	800
13	Upper Ottawa and Fennell	600
73	Kenilworth Access Loop	600
81	Parkdale and Barton	550
65	Ottawa and Barton	500
2	Upper James and Fennell	500
72	Kenilworth and King	500
83	Queenston and Reid	500
20	Main and McNab	100
85	Orphir and Gailmont	400
9	Upper Wellington and Concession.	400
79	Parkdale and King	400
69	Kenilworth and Cannon	400

* as given by Bus Passenger Survey

transfer movements occur where Barton, Cannon, Main and King Street cross Ottawa Street and Kenilworth Avenue. In this same general area other transfers occur between the Fennell and Bay Front routes at the Kenilworth access and between the Beach and Bay Front routes at the Kenilworth/Barton intersection where the Beach route terminates. In this area there are some 4,500 transfers occurring daily, ie. 18 percent of those on the total system.

In the East End significant transfer volumes occur at the intersection of the Parkdale and Barton routes and also at the terminals of the Barton, King and Delaware routes. These four locations account for some 2,000 transfer movements. The end to end transfers, Barton to Nash Barton, King to King Stub and Delaware to Stoney Creek are responsible for some 1,400 of these and the re-routing proposals discussed elsewhere are aimed at removing this group.

On the Mountain the only three significant transfer points are: Upper James and Fennell Avenue, Upper Ottawa and Fennell Avenue, and Upper Wellington and Concession Street at the Jolley Cut. These three points together account for some 1,500 transfers, some of which will be removed as a result of proposals made in the chapter on the Mountain routes.

ROUTE TO ROUTE TRANSFERS

Table 2 shows the transfers occurring between the 29 routes in the HSR system. On any given route the number of transferring passengers amounts to 20 percent to 50 percent of those paying fares. In most cases any routing changes which would benefit transfer passengers would disadvantage a greater number of through passengers. Thus, the main opportunities to reduce the number of transfers without inconveniencing users now enjoying a direct trip are to supplement existing routes with new routes or to link up existing routes where this would provide a through connection.

Where link-ups can be made without any disadvantage to existing passengers this should be considered if the transfer volumes are in the order of 500 to 1,000 per day. There are several locations both in Downtown and the East End where this type of transfer removal should be contemplated.

Where it would be necessary to divert a route in order to eliminate a transfer movement then transfer volumes in the order of 1,000 to 2,000 daily would be required to justify such a change. There are no locations where this volume of transfers occurs. However, if route changes are contemplated for other reasons (e.g. extensions into developing areas), then a knowledge of the existing transfer movements may permit a selection of routes which reduces a major existing transfer movement.

OPPORTUNITIES TO REDUCE TRANSFERS

The major locations at which transfers are concentrated are the Downtown area, the Ottawa-Kenilworth corridor, the Parkdale-Barton-Melvin intersections, the bus loops near the Red Hill Creek and the intersections of Fennell-Upper James and Fennell-Upper Ottawa on the Mountain. These locations have been examined to see what reduction of transfers can be effected:

- Downtown

There is one significant through routing already in effect in the Downtown area. This is the connection from West-Hamilton and Main West routes to the Delaware-Rosedale and Delaware-Potruff routes. It was introduced some years ago to eliminate some transferring in the Downtown area and is doing this.

It would also be possible to link up the King route with either the Aberdeen or the Locke route. However, this would be much less effective in reducing transfers and, in view of the operational problems of connecting a diesel to a trolley route, the idea has not been pursued further.

There are several possibilities for route connections involving linking up the Mountain routes through the CBD. Of these the ones which would reduce most transfers would be the linking of either the University or Bayfront routes to one of the major Mountain routes. These two strategies would each eliminate probably 200 to 300 transfers. This transfer reduction would not appear to be warranted when weighed against the operational difficulties that the connections might create.

- Ottawa Street-Kenilworth Avenue Corridor

After Downtown the next major group of transfer points occurs along Ottawa Street and Kenilworth Avenue. The major transferring movement involves trips with one end east of Kenilworth Avenue and the other end north of Barton Street. The trips involve mainly people who live in the East End and travel to the Greater Hamilton Shopping Centre or the industrial area along Burlington Street. The largest single movement is 1,300 transfers occurring in the Barton-Kenilworth intersection.

The seven points involved account for a total of 4,500 transfers and it is doubtful whether more than a fraction of these could be removed. The potentially most productive way of eliminating some transfers would be to add a route along Burlington Street via Ottawa Street and east on Main Street and this would remove some 400 transfers daily. However, it would not be feasible to reduce existing schedules to provide this

additional routing and the volumes involved would not justify a high level of service, therefore, specific recommendations for removing transfers are not possible at this point.

Since the Phase I Study in September 1971, a new transfer movement has developed in the Barton-Kenilworth intersection. This occurs between the Beach and the Bay Front routes and a large proportion of it is school trips destined south on Kenilworth Avenue. Transfers are required because the Beach route terminates here. There is also a substantial transfer movement between the Fennell and the Bay Front routes where they converge at the Kenilworth Access. This transfer is somewhat unexpected since these routes run parallel to one another and converge again on Burlington Street.

In order to reduce the transferring between the Beach and Bay Front and between the Bay Front and Fennell, it is proposed to extend the Beach route from its present terminal at Barton Street via the Kenilworth Access to Upper Ottawa and Limeridge. This extension is described under "Service through the Central Area".

- Parkdale, Barton, Melvin

A moderately large movement of some 750 daily transfers occurs at this pair of intersections. The largest component is the movement from the industrial attractors and apartment buildings north and east of the intersection, wishing to travel westward on the Barton route. The Barton route, however, continues east to Talbot and Melvin where it picks up a transfer movement from the Nash-Barton service amounting to only 200 trips daily. In this circumstance it would appear that the Barton route should be diverted to the Glow-Woodward area to serve the heavier movements. However, such a diversion would involve complicated

routings and extension of the trolley overhead. Over a longer period the more attractive change is the easterly extension of the Barton route which would provide positive attraction for new passengers from the area east of Red Hill Creek.

- Terminals Near the Red Hill Creek

The Barton and King trolley routes terminate just west of the Red Hill Creek. The Potruff branch of the Delaware route loops just east of the creek. At each of these points, transfers occur onto short routes which act as extensions to the trunk routes. At these locations all of the transferring could be eliminated by the easterly extension of the trunk routes. Such extensions would have no detrimental effects on other passengers except for the indirect effects of route extensions making scheduling and schedule adherence more difficult. The transfer removal causes some operational problems which are discussed with the East End.

Complete removal of the "in-line" transfers at these three terminals would reduce total transfers by 800 to 1,000 daily. The greatest benefit would be felt from the King to the King Stub route where there are now 500 daily transfers. Further discussions of short and longer term proposals for making changes in this area are discussed in service in the East End.

- Mountain Locations

Nearly 600 transfers occur at the Upper Ottawa-Fennell intersection from the Upper Ottawa and Upper Kenilworth routes to the Fennell route. The largest component of this transfer movement is a group of trips with origins south of the intersection and destinations northward of the Kenilworth Access.

A large proportion of these transfers will be eliminated by the proposed extension of the Beach route.

Some 500 transfers occur daily at the Upper James-Fennell intersection. Many of these involve trips with origins south and west of Mohawk and West 5th Street transferring to reach the Central Business District. As discussed elsewhere in this report, the provision of a new CBD service on West 5th Street would be effective in reducing the transfers at this location.

400 transfers occur at the top end of the Jolley Cut where Upper Wellington Street and Concession Street intersect. The convergence of Mountain routes at this point make it accessible from all directions and it is, therefore, a good interchange point between the different Mountain routes. There is no concentration of route-to-route movements which would make it logical to consider anything other than the present service through this area.

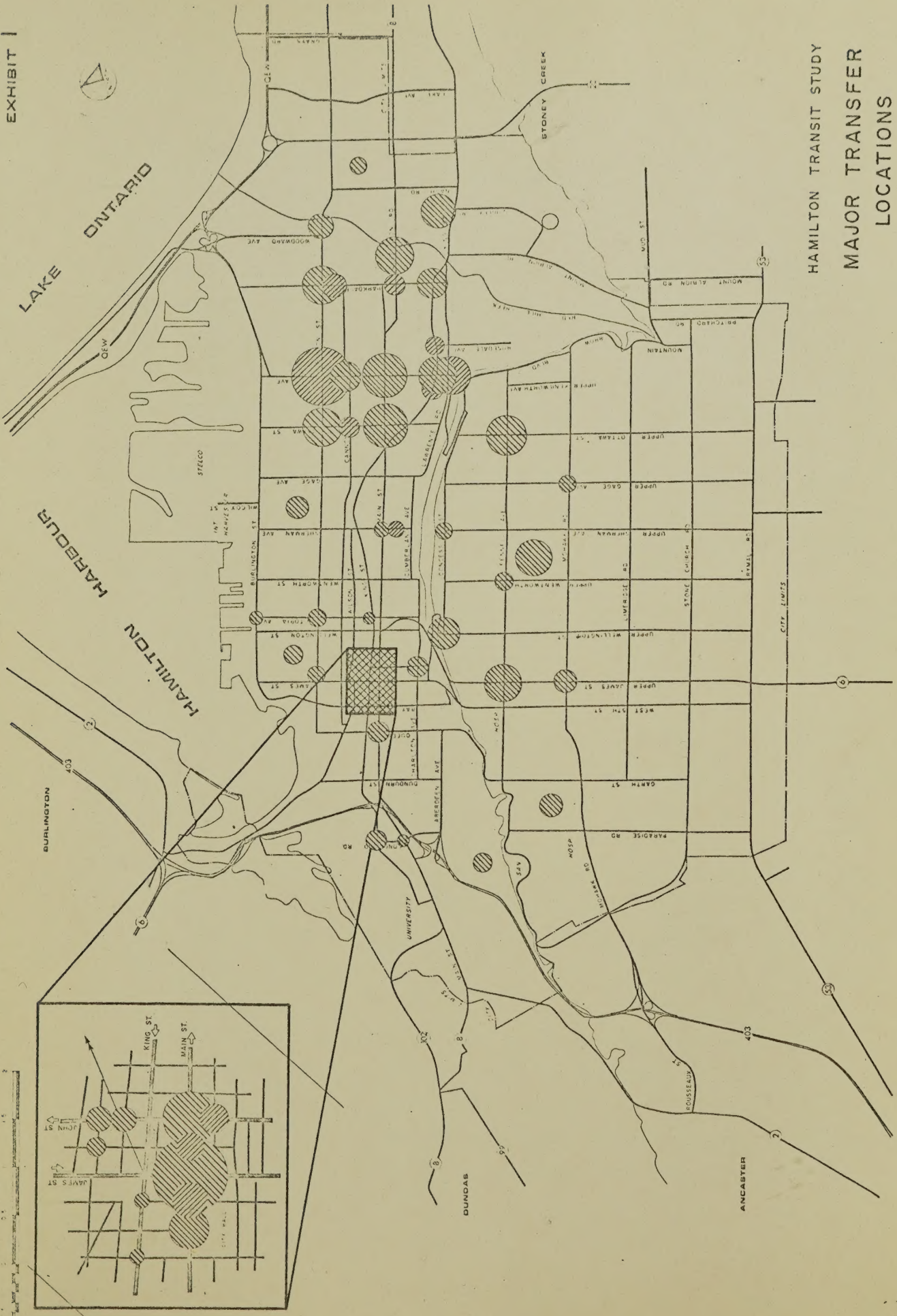
CONCLUSION

Although a substantial number of transfers occur daily on the HSR system, there are only a very few locations where transfer elimination is feasible. At most locations where transfers occur, the route changes which would remove transfers would also prove detrimental to the passengers now enjoying direct service.

Some further linking-up of routes in the Downtown area will help to reduce the largest concentration of transfers.

The second largest concentration of transfers in the Ottawa-Kenilworth corridor could only be reduced by route diversions which would have to be warranted in terms of significant operational improvements. That is, reasons other than the transfer volumes would be required to justify changes.

Suggestions for removing the "in-line" transfers in the East End will be made in a later section of this report and proposals made for the Mountain will be effective in reducing some of the existing transfers.



HAMILTON TRANSIT STUDY
MAJOR TRANSFER
LOCATIONS

HAMILTON TRANSIT STUDY

Working Paper No.3

PHASE II

SERVICE ON THE MOUNTAIN

Phase I of the Hamilton Transit Study recommended that further study be carried out to see if rearrangement of the route pattern on the Mountain is warranted. In view of the large number of trips to and from the Mountain, it was suggested that there might be merit in re-orienting the routes to a high-capacity north-south corridor.

A number of alternative trunk and distribution systems have been developed and compared with the existing route system on the Mountain. These comparisons were made on the basis of trip patterns derived from the Bus Passenger Survey.

EXISTING MOUNTAIN SERVICES

Over one-third of the total daily trips on the Hamilton Street Railway are generated by areas on the Mountain. The breakdown of transit use is shown in Table 1.

Exhibit 1 shows the desire lines of trips between the Mountain and other points in the city. The heavy movement to the CBD and the predominance of trips from areas served by the routes using the Jolley Cut is shown.

Exhibit 2 shows the desire lines of trips with both terminals on the Mountain. It is noted that for clarity the scale of the lines on this exhibit is five times that used on Exhibit 1. The heavy movement to the area at Stone Church Road and Upper Sherman is largely composed of school trips to and from Southmount Secondary School.

TABLE 1
PRESENT TRANSIT USE
HAMILTON MOUNTAIN AREA

	<u>WEEKDAY</u> <u>PASSENGER TRIPS</u>
Total HSR System	90,000
Traffic Associated with the Mountain	32,000
Trips between Mountain and the CBD	12,400
Trips between Mountain and the Central Lower City	5,700
Trips between Mountain and the Lower City east of Ottawa Street	3,600
Trips between Mountain and the Lower City west of the CBD	3,700
Trips between Mountain and the Industrial Area	1,000
Local trips on the Mountain	6,000

The present routes operating on the Mountain are shown in Exhibit 3 and general operating statistics are given in Table 2.

From Exhibit 3 it can be seen that the major bus access over the escarpment is by the Jolley Cut which is used by seven services. This access gives the most direct route to the CBD as well as a number of important attractors such as St. Joseph's Hospital. Connections to the major east-west routes and the Bayfront service are available in the CBD. The Jolley Cut routes serve Concession Street, Upper James and other important attractors on the Mountain. As a result of these factors, routes using the Jolley Cut are frequent, well used and show good financial results.

Access over the escarpment via Beckett Drive is used by the Sanatorium and Garth routes serving the western end of the Mountain. These routes provide service to the CBD from the west. On the Mountain, the Sanatorium route serves Chedoke Hospital as well as the surrounding residential areas. It is a well established route and performs well financially with revenue of 98.0 cents per bus-mile in 1972. The Garth route serves a number of newly developing residential areas, and while its present performance is below standard, with revenue of 69.7 cents per bus-mile, indications are that as development continues, the results will improve.

The Fennell route uses the Kenilworth Access to reach the lower city and the industrial area along Burlington Street. This route carries out a number of functions. On the Mountain, it serves a dual function as the major east-west route, and provides local service west of Upper James. It provides access from the Mountain to the city below the escarpment via the Kenilworth Access. Local service is provided on Ottawa Street and to the industrial area. It is the longest route serving the Mountain. It has three different terminals on the Mountain and two at the northern end. Its financial performance is reasonably good, at 76.4 cents revenue per bus-mile for 1972.

The Mohawk route is the only route completely contained on the Mountain. It extends completely across the Mountain in an east-west direction. In financial terms the performance of this route is poor with revenue of only 50.5 cents per bus-mile in 1972.

The major problem of service on the Mountain is the restriction in the number of access points from the Mountain to the lower city. This tends to concentrate the services particularly at the top of the Jolley Cut and in the CBD.

Another problem is the relatively light development south of Mohawk Road. While these areas require and are given service, the population has not reached a density that will generate sufficient trips to make transit economically viable.

In general the grid pattern of streets on the Mountain is ideal for transit. However, in a number of areas on the Mountain, development has taken place in a manner which does not allow the efficient use of transit. Some dense developments are located away from major arterial streets. Other areas, designed to discourage through car traffic, make access to bus routes difficult.

The basic north-south route configuration oriented to the central business district via the Jolley Cut is an excellent one. The pattern of existing transit trips on the Mountain is closely related to the present route configuration and any change would disrupt a large number of present riders.

An alternative, based on re-orienting the routes to an east-west configuration centered on a major corridor to the CBD was examined and rejected. The short-term improvements proposed involve one minor route relocation on the east side of the Mountain, changes to the Mohawk and Fennell routes on the west side of the Mountain and a new route on West 5th Street.

CORRIDOR SERVICE

An alternative system of bus routing, based on the establishment of a major north-south corridor on the Mountain, was examined. Routes would branch out from this corridor on the east-west arterials rather than the present north-south arterials.

While this concept might be acceptable in the future when development of the areas on the Mountain has been completed, it cannot be recommended at this time for the following reasons:

1. This concept does not serve a number of existing trips to destinations on the Mountain. Destinations along Concession Street attract trips from points on the Mountain which are well served by the present route configuration.
2. The east-west arterials are generally 5/8-mile apart compared with 1/2-mile on the north-south arterials. A change to the use of east-west streets would increase the walking distance beyond the acceptable 1/4-mile distance for a number of residents.
3. Development south of Mohawk Road is scattered. These areas can best be served by selective extension of the north-south routes as development takes place. Use of the east-west arterials such as Limeridge and Stone Church would require long uneconomic routes similar to the Mohawk route.
4. No significant cost or time savings would be secured by adopting this arrangement.

For these reasons the concept of a major north-south corridor was not examined in detail.

PROPOSED ROUTE CHANGES EAST OF UPPER JAMES

The routes on the east end of the Mountain give direct service to CBD via the Jolley Cut and serve the commercial activity and high density residential development along Concession Street. In fact the zones fronting on Concession Street are responsible for approximately 6,000 trips or 19% of the total trips generated on the Mountain. Thus no major changes are required in these routes. One minor change is proposed for the Upper Ottawa route as shown in Exhibit 4.

Upper Ottawa

It is suggested that the Upper Ottawa route should be diverted along Queensdale Avenue between Upper Gage and Upper Wentworth Streets. This will provide service midway between Fennell and Concession with reduced walking distance for many of the residents along Queensdale Avenue. It is estimated that less than 20 of the present passengers on the Upper Ottawa route will be disadvantaged by this change and that approximately 800 present passengers will have better access to a bus route to the CBD.

PROPOSED ROUTE CHANGES WEST OF UPPER JAMES

Changes are proposed in the Fennell and Mohawk routes to improve their effectiveness in the area west of Upper James. A new route is suggested on West 5th Street to provide direct service to the CBD from the developing area south of Mohawk. These proposals are shown in Exhibit 4.

Fennell

The Fennell is a long route basically serving as the major east-west route on the Mountain. At West 5th Street it branches into a north-

south route and a local distributor serving the western residential area by a devious route. Some of this part of the route duplicates the Mohawk routing contributing to the relatively poor showing west of Upper James Street.

It is proposed to divert the Fennell from West 5th Street and South Bend via Laurier Avenue or Stacey Street to Bendamere Avenue, then westerly on Bendamere to Upper Paradise. This will take service into a residential area with a population of 4,000 people which presently has poor coverage. The road system of the area provides poor pedestrian access to the arterials used by the present routes. Terminating the Fennell at Bendamere and Upper Paradise does not remove service beyond acceptable walking distance of the residences west of this point.

It is also proposed to delete the MacLanders leg of the Fennell route and replace it with a new West 5th route connecting to the CBD. The use of the Fennell route for service on the north-south arterial is not desirable as it extends an already long route and does not serve the dominant desire for service to the CBD. At the present time, the HSR has plans to extend the Fennell service on West 5th Street to Stone Church Road. It is proposed that the new service should terminate at this point.

Mohawk

The Mohawk is the poorest route on the Mountain in financial terms. Its revenue in 1972 was 50.5 cents per bus-mile. It is an east-west route serving trips almost mainly contained on the Mountain. The close spacing of the north-south routes make them more attractive for a direct trip to the CBD. The Mohawk has the lowest percentage of transfers on the Mountain indicating relatively little

use is made of the route to reach the north-south services.

It is therefore proposed to strengthen the function of the Mohawk as an internal Mountain route. The major attractor of trips on this axis is the Chedoke Hospital. At the present time the Hospital is served by the Sanatorium route from the CBD, but there is no direct penetration by either the Fennell or the Mohawk.

Within the near future, Rice Avenue will be completed between Mohawk Road and Sanatorium Road. At that time we propose that the Mohawk service be branched at Rice Avenue with one leg serving Brow Infirmary and Chedoke Hospital and the other serving west along Mohawk Road. This branch to Chedoke Hospital will allow convenient cross-Mountain trips into the Hospital, will serve the area along the west end of Sanatorium Road and connect to the Sanatorium service.

Approximately 140 trips per day are presently being made between the Chedoke Hospital area and other zones on the Mountain. These trips will be benefited by this extension.

The second proposal is to divert the Mohawk route north on Upper James to Wembley, west on Wembley and south on West 5th Street to Mohawk.

This will bring the Mountain Plaza Shopping Centre and Mohawk College into scope for residents along the Mohawk route and will give a transfer point to the new Fennell route. This detour will affect 170 present transit trips by adding about three or four minutes to the travel time for trips across the Mountain.

The proposal to divert the Fennell service from Mohawk Avenue between West 5th and Garth should improve the performance of the Mohawk route.

West 5th Street

It is proposed to operate a new service to serve the developing demand for public transit along West 5th Street. This service will connect to the CBD via the Jolley Cut and will replace the present Fennell service to MacLanders.

We can expect that approximately 1,000 present trips will be diverted from the Upper James and Fennell services to the new route. Of these 110 will be benefited by a direct trip to the CBD and 80 will be required to make an added transfer. The balance will not be affected. The present proposal is based on service frequency equal to that presently provided on West 5th by the MacLanders branch of the Fennell route. The provision of a direct service to the CBD may result in a reduction in trips on the Upper James route. In this case some mileage can be saved on that route to offset some of the cost of operating the West 5th route.

Present plans of the HSR are to extend the Fennell on West 5th Street to Stone Church Road and it is proposed that the new service should extend to this point.

Upper Paradise

A long term recommendation is for the eventual operation of a new route on Upper Paradise Road. This route should be initiated when development along Upper Paradise, south of Mohawk Road, reaches a point where service is justified.

OTHER ROUTE REVISIONS

A number of other proposals were examined which involved diversion of routes to the Claremont and Kenilworth Access roads. All of these proposals were found to disadvantage a greater number. Accordingly these proposals were not developed in detail.

The one proposal which has merit is to provide a supplementary service from the Mountain down the Claremont Access to the area between Wellington and Ottawa Streets. This proposal is covered in the section dealing with service in the downtown area.

EFFECT OF PROPOSED CHANGES

Table 3 outlines the operating recommendations to accompany the proposals made for the new routes. These are general recommendations which will require detailed study before the proposals are put into operation.

Table 4 gives the operating requirements required in terms of number of buses required and annual bus-hours. These figures are given for both present and proposed routes in the proposals. The net difference is a measure of the cost of making these changes.

TABLE 3

OPERATING RECOMMENDATIONS FOR PROPOSALS ON THE MOUNTAIN

R O U T E	ROUTE LENGTH Miles	RUNNING TIME Minutes	HEADWAY IN MINUTES			
			PEAK	BASE	EVENING	SATURDAY SUNDAY
UPPER OTTAWA	5.6 (5.6)	21/26 (21/26)	12 (12)	30 (30)	30 (30)	30 (30) 50 (50)
FENNELL 1	9.9 (10.8)	36/50 (39/55)	10 (11)	15 (16)	20 (20)	20 (20) 30 (30)
MOHAWK 2	6.1 (5.4)	19/25 (17/22)	15 (15)	20 (20)	20 (20)	20 (20)
WEST 5TH	6.5 (New)	24/30	15 (21)	30	30 (None)	None (None)
			3			

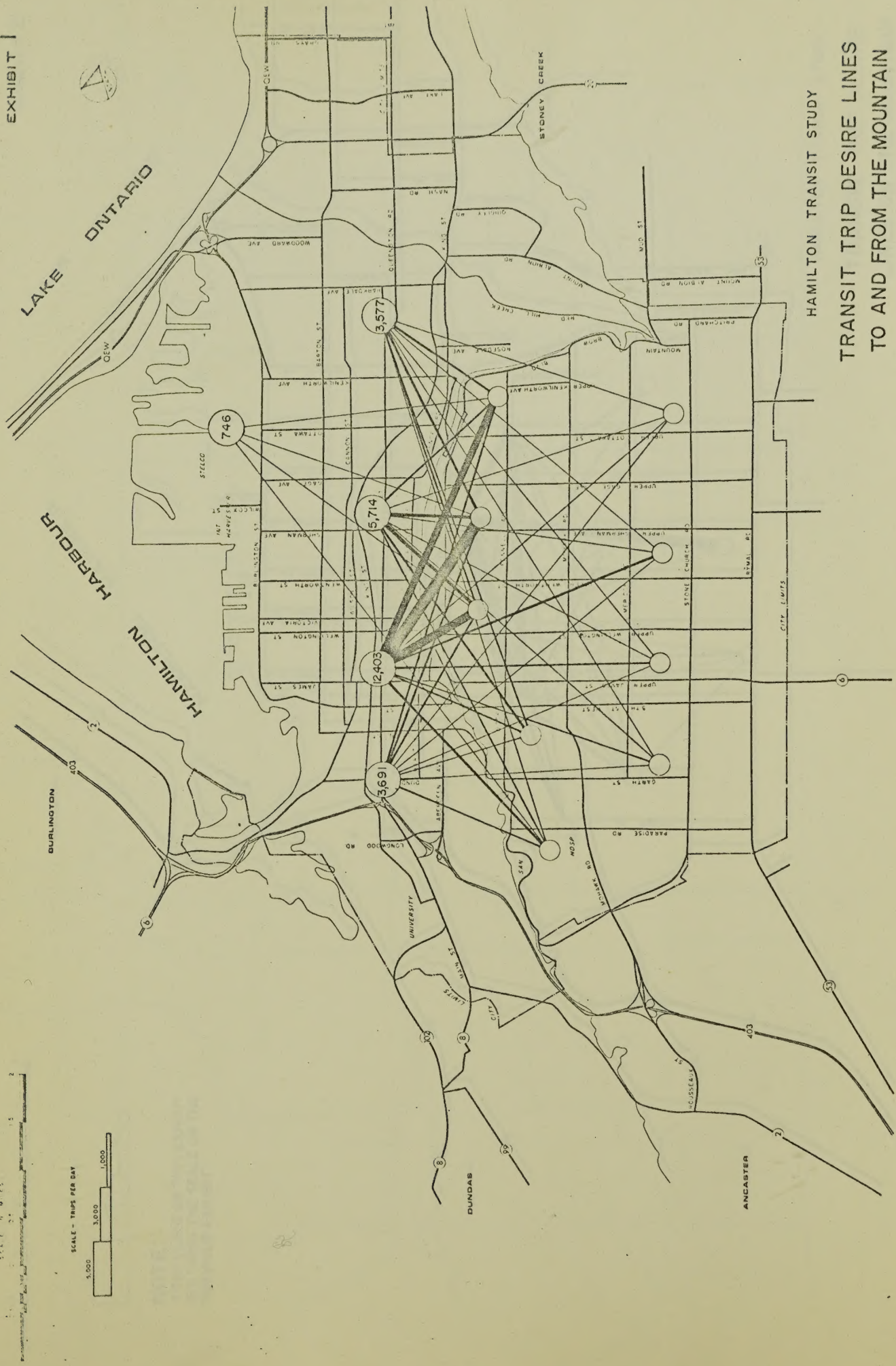
NOTES:

- 1 Based on Industrial and Gage to Upper Paradise
 - 2 Every second bus to terminate at Chedoke Hospital
 - 3 By present Fennell route
- () Numbers in brackets are for present routes.

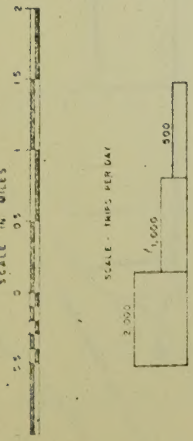
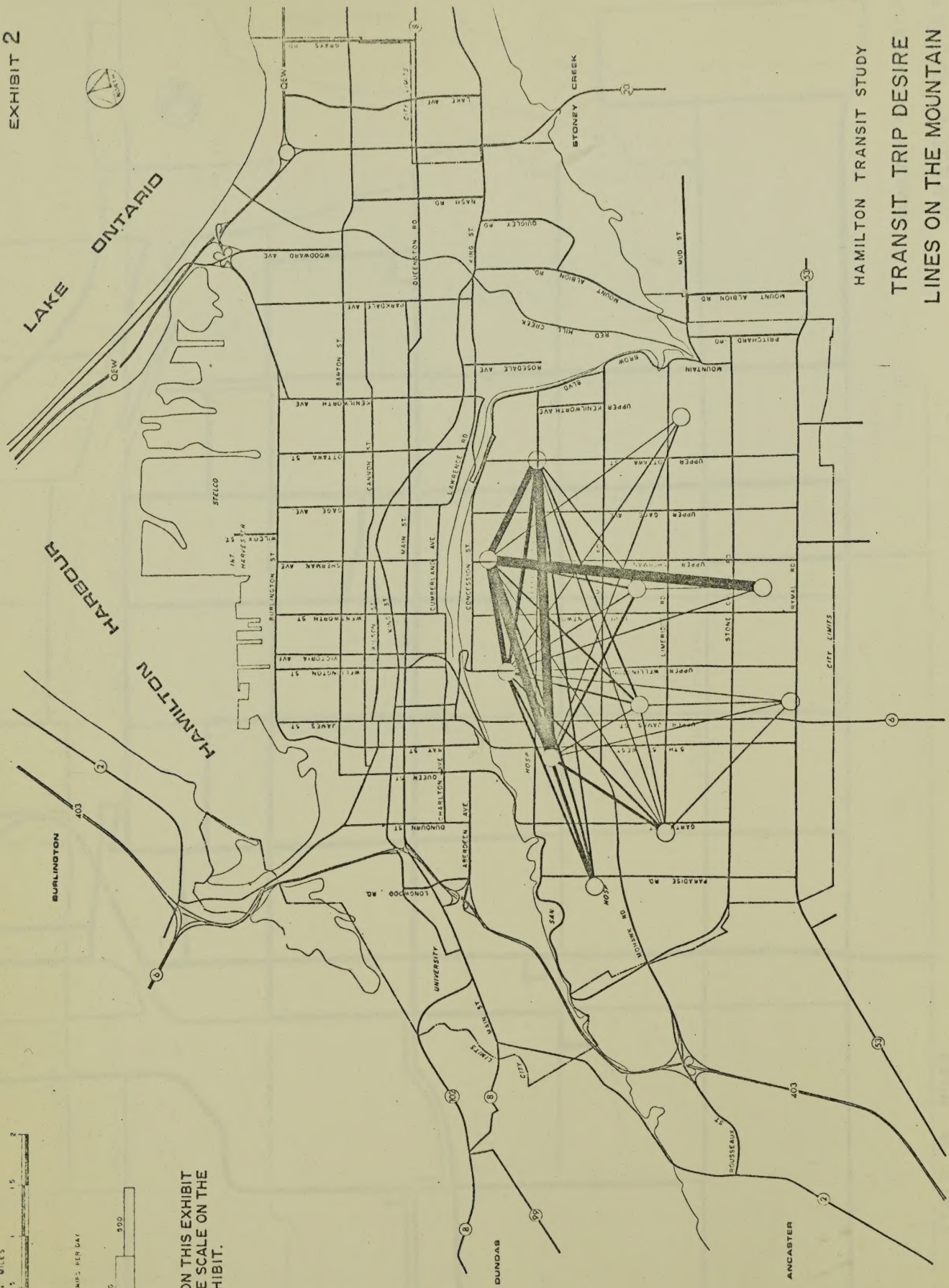
TABLE 4

OPERATING REQUIREMENTS FOR PROPOSALS ON THE MOUNTAIN

<u>R O U T E</u>	<u>BUSES REQUIRED IN PEAK</u>		<u>ANNUAL BUS-HOURS</u>	
	<u>PRESENT</u>	<u>PROPOSED</u>	<u>PRESENT</u>	<u>PROPOSED</u>
UPPER OTTAWA	5	5	19,600	19,600
FENNELL	9	8	36,500	35,200
MOHAWK	3	4	12,300	15,000
WEST 5TH	None	4	None	12,700
T O T A L	17	21	68,400	82,500
		17		68,400
Difference	-	+ 4	-	+ 14,100



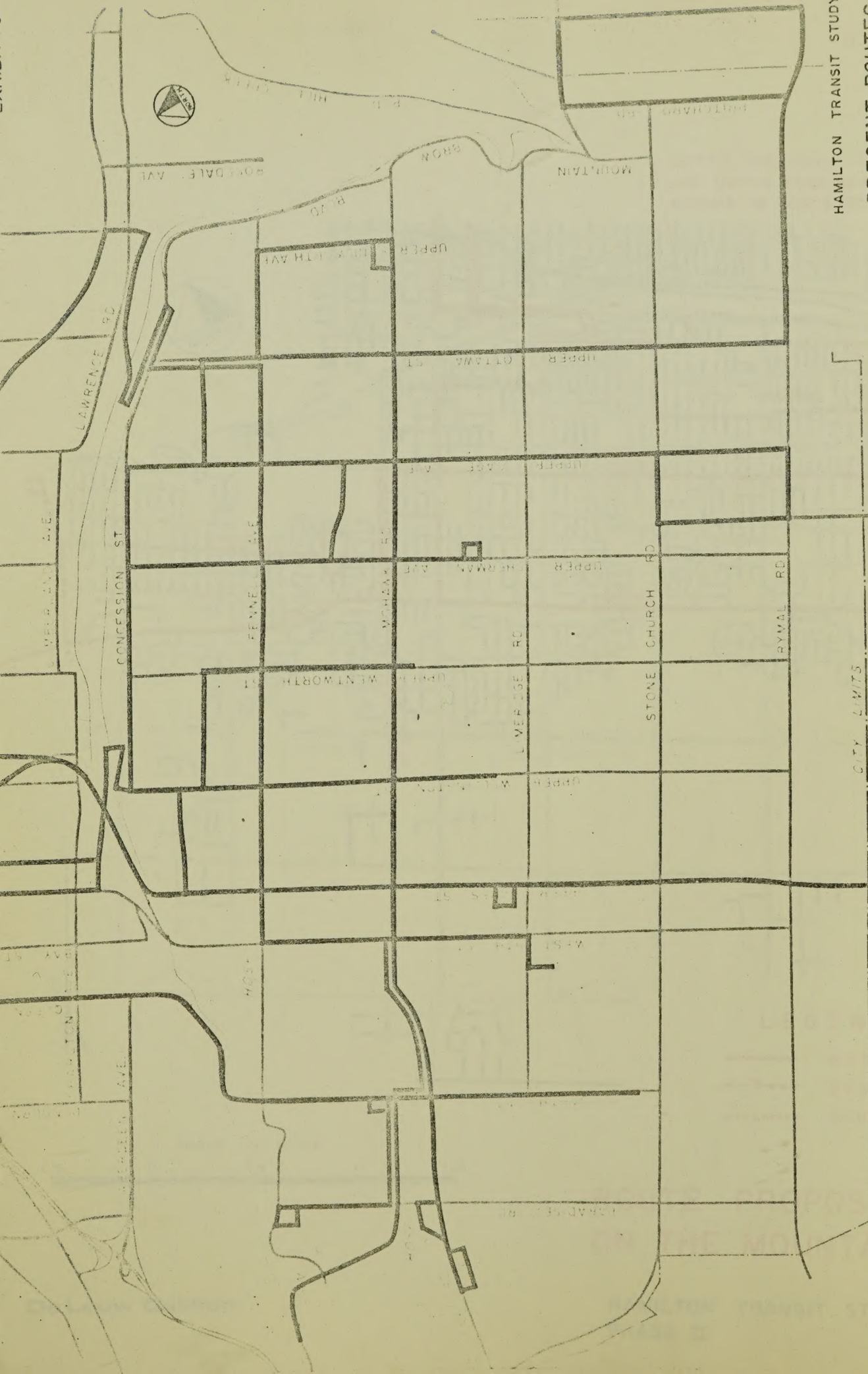
HAMILTON TRANSIT STUDY
TRANSIT TRIP DESIRE LINES
TO AND FROM THE MOUNTAIN



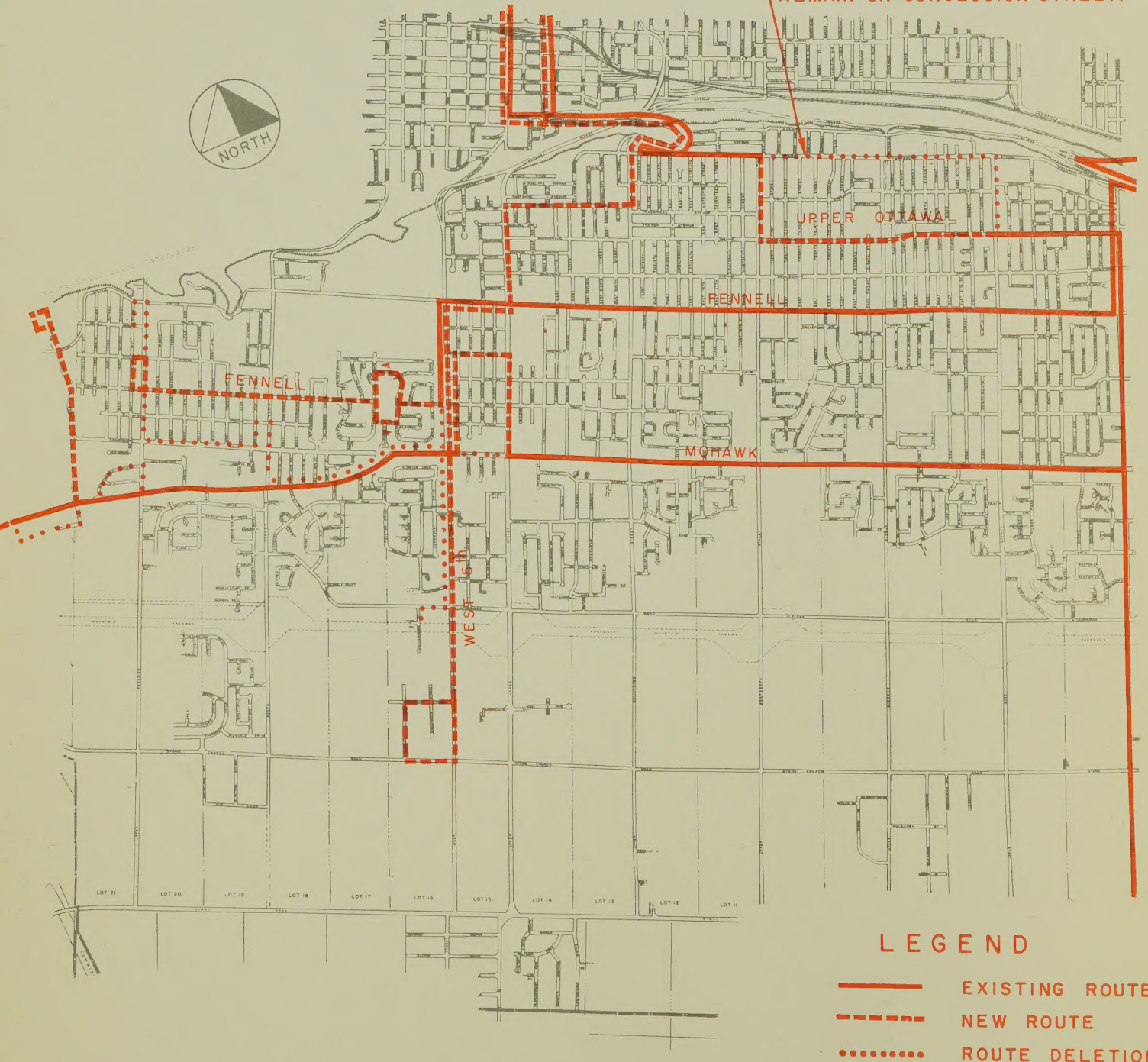
NOTE:
TRIP SCALE ON THIS EXHIBIT
IS 5 TIMES THE SCALE ON THE
PREVIOUS EXHIBIT.

HAMILTON TRANSIT STUDY
TRANSIT TRIP DESIRE
LINES ON THE MOUNTAIN

A horizontal scale bar labeled "SCALE IN MILES" with markings at 0, 0.5, and 1.5.



UPPER SHERMAN, UPPER GAGE
AND UPPER KENILWORTH SERVICES
REMAIN ON CONCESSION STREET.



LEGEND

- EXISTING ROUTE
- - - NEW ROUTE
- ROUTE DELETION

ROUTE PROPOSALS ON THE MOUNTAIN

HAMILTON TRANSIT STUDYPHASE IISERVICE IN THE EAST ENDWorking Paper No.4

This report deals with transit service in the area of the City east of Red Hill Creek and in the adjoining municipality of Stoney Creek. Transit service in this area is provided by the Hamilton Street Railway Company and its subsidiary, Canada Coach Lines. The existing HSR route network is shown in Exhibit 1. Statistics for these HSR routes are given in Table 1.

In this area of the City, CCL and HSR operate over some sections of common route but this is not a duplication of service in the normal sense. Routes operated by HSR provide local service and free transfer connections to other HSR bus and trolley coach routes, while CCL offers local service and express service to the downtown area of Hamilton without transfer privileges to other routes on the HSR system.

The area of Hamilton east of Red Hill Creek has a population of 14,000 and the population of Stoney Creek is 9,800. Some 4,200 transit trips originate or terminate in this area on a typical weekday giving a trip generation ratio of 0.2 weekday trips per capita, as compared to a ratio of 0.3 for the City as a whole. This lower ratio of trips in the east end reflects the lower level of service in the area as well as the distance from major activity centres.

The total transit trips associated with the area are broken down in Table 2 to show trip distribution within the area and to other parts of the City. Over 90% of HSR passengers in the east end must transfer to complete their trip by bus. Only four routes, the Barton, Cannon, King and Delaware, are accessible with a single transfer. Connection to any other route involves two transfers, a decided deterrent to transit use.

TABLE 1

EAST END ROUTE STATISTICS 1972

Route	Length (Miles)	Headways (Minutes)			No. Buses (Peak)	Revenue Pass. (000's Per Year)	Transf. Collect. (000's Per Year)	Bus Miles	Revenue ¢ Per Mile
		Peak	Base	Evening Sat. Sun. Hol.					
Nash-Barton	4.5	20	40	40	*	122	61	81	47.5
King Stub	2.8	20	30	30	*	71 (May - Dec. 1972)	56 Dec. 1972)	32	71.2
Stoney Creek	2.3	20	30	30	*	22 (May - Dec. 1972)	10 Dec. 1972)	31	32.1
Parkdale (to Mt. Albion and Harris)	N/A	20	60	(30) (Thurs. Fri. only)	*	N/A	N/A	N/A	65.4

* No Service at these times

TABLE 2

PRESENT TRANSIT USE
HSR SERVICES EAST OF RED HILL CREEK

	<u>Weekday Passenger Trips</u>
Total HSR system	90,000
Total associated with the East End	4,250
Trips between East End and CBD	800
Trips between East End and other areas West of Wellington Street	700
Trips between East End and the Central Lower City (Wellington to Ottawa)	800
Trips between East End and the Lower City (Ottawa to Red Hill Creek)	1,250
Trips between East End and the Mountain	400
Local trips within the East End	300

The east end is growing rapidly and there is increasing pressure for better service in this area as well as in the Town of Stoney Creek. In determining the potential for improved service in this area we have firstly developed a routing concept which could have application over the next three to five years and then developed an immediate programme as required for this study for implementation over the short term which will be compatible with the longer term concept.

The main features considered were existing and future land use development, transit coverage, present and future streets and co-ordination between HSR and CCL services. Public suggestions and comments were obtained at two public meetings in the area which provided excellent input in the planning process. The short term changes proposed are summarized in Exhibit 3 and Table 3.

LONGER TERM CONCEPT

Our basic longer term recommendation is to develop a strong focal point for transit services in the East End where local and trunk services would be co-ordinated to provide convenient interchange between various routes. This focal point should be a major centre of activity so that it is not only a transit terminal but also a main destination point for transit users.

A logical place for this focal point is on Queenston Road between Nash and Centennial where the major commercial development in the east end is located. The longer term routing concept is shown in Exhibit 2. In brief this concept would involve:

- extension of the Barton, King and Delaware routes to the focal point, to provide direct connection to major parts of the City

TABLE 3

PROPOSED SERVICE CHANGES
IN THE EAST END

<u>Existing Route</u>	<u>Short Term Program</u>	<u>Longer Term Concept</u>
Barton (Trolley)	No Change	Extend to Eastgate
Cannon (Trolley)	No Change	No Change
King (Trolley)	No Change	Extend via Queenston
Delaware - Potruff	Extend to Eastgate via Centennial Parkway	Extend to Eastgate via Centennial Parkway
Delaware - Rosedale	No Change	Extend via Greenhill to Quigley
Parkdale	Minor Extension	Minor Extension
Nash - Barton	Off-peak service to Eastgate via Queenston Road	Via Quigley, Nash, Queenston Road to Eastgate
	Off-peak service to Eastgate via Lake and Delaware	Via Delaware to Eastgate (Also serves Curtis)
King Stub	Extend West to Kenilworth and East to Saltfleet	Incorporate into King/Queenston Trolley Coach Route
Stoney Creek	From Grays via Highway 20 to Eastgate	From Grays via Highway 20 to Eastgate

- local routes feeding into the focal point from the north, south and east; these could be fixed routes or dial-a-bus service
- express service from this focal point to the central business district in Hamilton and to other parts of the City if warranted by demand
- park-and-ride facilities for those who wish to connect with transit service by auto
- connection with CCL inter-city and suburban services

It is beyond the scope of this study to detail this longer range proposal; however, we do believe that if it is attractive, the City should take immediate steps to determine the requirements and protect property for the proposed transit centre and parking in the Nash-Queenston-Centennial area.

The extension of the King trolley bus route along Queenston Road to Centennial and perhaps beyond this point is a major element in the proposal. We understand that the HSR is presently determining the costs for electrification of this extension.

We also believe that the Barton trolley route and the Delaware diesel bus route should be extended to the focal point. This will place a major traffic generator at the end of these two routes to improve their attractiveness. It will also give passengers the option of using three trunk routes to reach points west of the Red Hill Creek. This, we feel, is a greater advantage than extending line routes east along Barton or King Street beyond Centennial.

The local routes shown on Exhibit 2 indicate the minimum coverage that should be provided for residents using a fixed route system. The focal point concept lends itself to dial-a-bus operation, if this type of service is selected for all or part of the local area in the future.

When Greenhill Avenue is built across Red Hill Creek, the Vincent-Red Hill area should be served by an extension of the Delaware-Rosedale route. This will give direct service without transfer to the Downtown area of Hamilton. A local Quigley route would also remain to connect this area with other parts of the east end and the transit centre.

RECOMMEND SHORT-TERM PROGRAM

The following steps are recommended in achieving the longer term concept as described above. This program covers changes which would not involve extension of the trolley coach electrification. The proposed routes are illustrated in Exhibit 3.

- Delaware Route

Extend the Delaware route from Potruff Road to Centennial and Queenston Road along King Street. This will permit revision of the present Stoney Creek Stub route which now operates from Potruff to Jones.

This extension will give residents along the Delaware route a direct connection to the Queenston Road commercial area with a consequent potential to build up two-way traffic on this important route.

The routing and any cost-sharing for this route extension will have to be negotiated with the Town of Stoney Creek.

- Stoney Creek Stub

Replace the present Stoney Creek Stub with a new route operating from Eastgate Plaza, south on Highway 20 to King Street,

then east along King Street to loop around Grays Road and Jasper. This service will substantially improve the coverage for Saltfleet residents and provide them with a selection of HSR routes into Hamilton and access to the Queenston Road Commercial area. It will require the 150 trips now using the present Stoney Creek Stub to transfer to the Delaware at King and Centennial rather than Potruff. They do have the option of using CCL services.

This route would be developed in cooperation with the Town of Stoney Creek and Saltfleet.

- King Stub

The Commission is planning to extend the King Stub to Grays Road in response to requests for additional service from Hamilton residents and the Town of Stoney Creek. This extension will be in line with the Commission's policy to provide service to all built-up parts of the City. We would also recommend that this route should be renamed the Queenston Road route.

- Nash-Barton Route

It is proposed that the off-peak Nash-Barton service be diverted to the Eastgate Shopping Centre at two points. The Nash Road segment via Queenston Road and the Barton Street segment via Highway 20, Delawana and Lake Avenue. These diversions will give residents along the Nash-Barton route improved access to a major commercial centre.

- Express Services

CCL services now operating in this area provide express connections which save 10-20 minutes in travel time between the east end and Downtown Hamilton. The premium fare to use CCL services is 10¢ to 15¢ per ride. In view of the availability of the CCL routes we do not see any scope for HSR to duplicate express service in this area, but recommend a program to publicize CCL services which now exist and determine if there is a strong demand for express service to Downtown.

Passengers using the CCL routes do not obtain transfer privileges to HSR routes. Although this privilege could attract more passengers to CCL, we do not believe that it should be initiated at this time for four main reasons:

- 1) Time savings to intermediate points are not significantly greater on CCL routes as compared with HSR routes.
- 2) CCL buses would not be able to maintain their present schedules if frequent stops were required for transferring passengers.
- 3) There is a limited capacity available using CCL equipment.
- 4) CCL fare policy should be determined after HSR fare policies for Stoney Creek are agreed to.

It is recommended that one or two express trips should be tested through the a.m. and p.m. peak periods between the Vincent area and Downtown Hamilton. The survey indicates that some 120 passengers would be served by such express trips. Since there are no CCL

services into the Vincent area, this service should be operated by the HSR.

It is suggested that all of the above proposals should be implemented and publicized as one package so that integrated schedules can be developed from the outset. This means that there would be a minimum wait for transferring passengers at the Queenston Road focal point.

The various proposals listed above will require additional service. Requirements for additional buses as well as increased bus hours are shown in Tables 4 and 5.

TRAFFIC POTENTIAL

It is extremely difficult to estimate the effect of the proposed service changes on revenues and it will take time for the public to become accustomed to any new service. However, we believe that the trip generation from this area should increase to the city-wide average which is about that experienced on the Mountain. This would produce 6,300 daily trips as compared to 4,200 at present. This is equivalent to an increase in revenues of \$160,000 per annum as compared to annual costs for the improvement proposed of \$190,000 to \$290,000.

TABLE 4

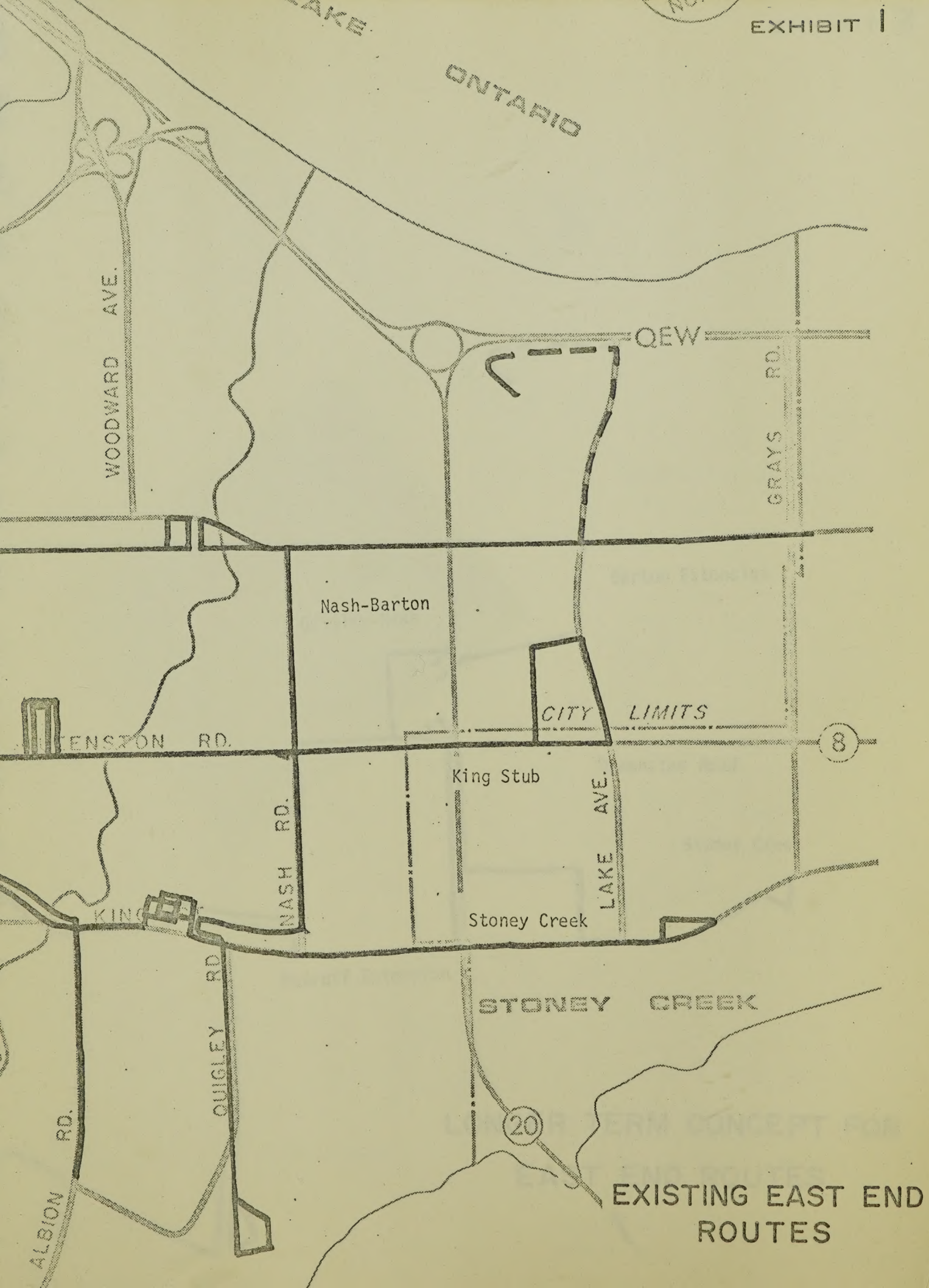
OPERATING RECOMMENDATIONS FOR SHORT TERM PROGRAM
(PRESENT CHARACTERISTICS IN BRACKETS)

Route	Route Length (miles)	Running Time (minutes)	Headways (Minutes)			
			Peak	Base	Evening	Sat. Sun. Hol.
Quigley-Nash	3.5 (3.0)	15 (12)	20 (20)	30 (40)	30 --	30 --
Barton Extension	2.5 (1.5)	10 (5)	20 (20)	30 (40)	30 --	30 --
Queenston Road	4.0 (3.0)	15/20 (9)	20 (20)	30 (30)	30 --	30 --
Potruff Extension	1.6 --	7 --	10 (10)	20 (20)	20 (20)	30 (30)
Stoney Creek	2.6 (2.3)	10 (9)	10 (20)	20 (30)	20 --	30 --

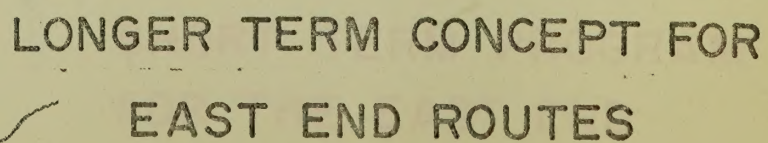
TABLE 5

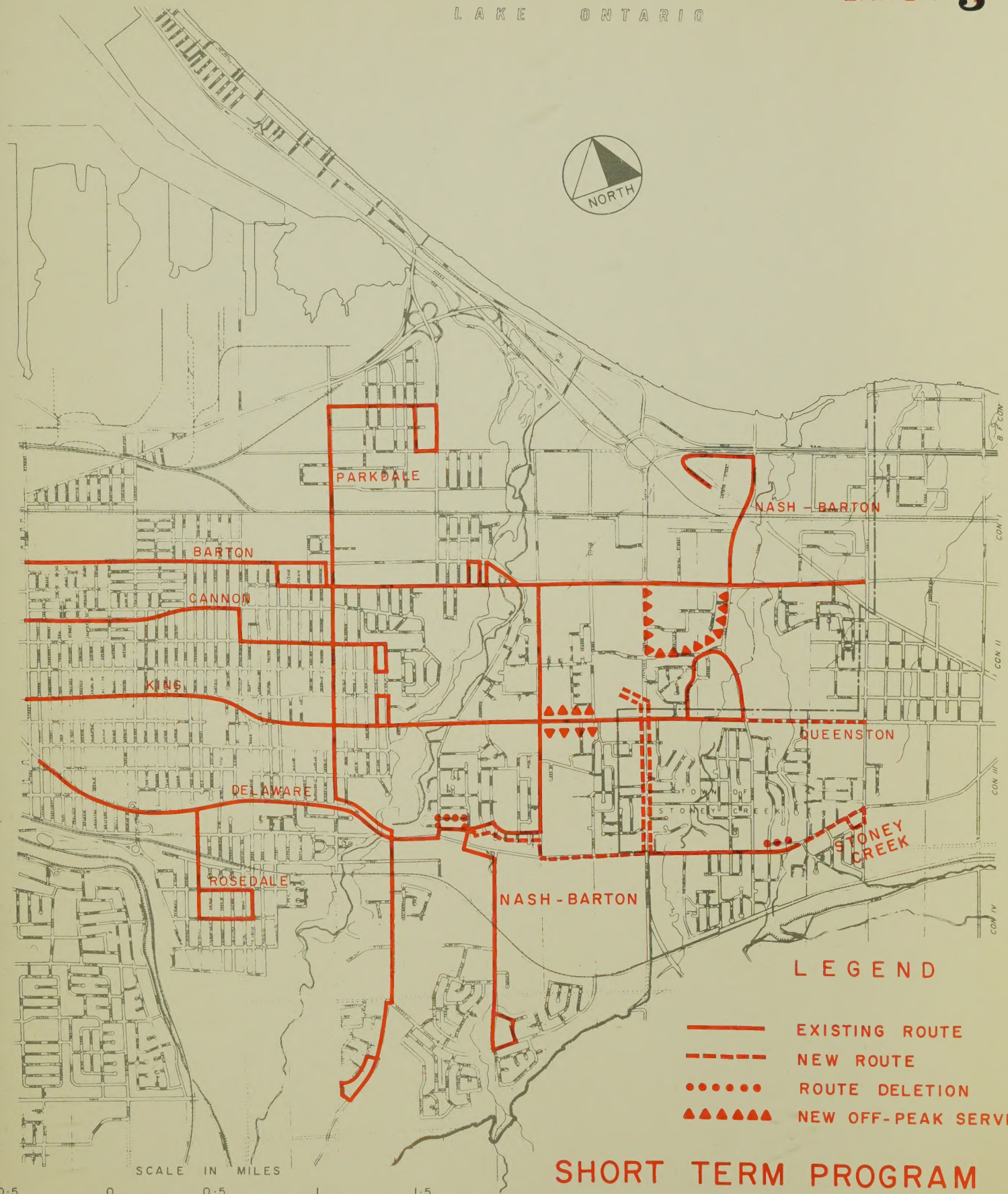
OPERATING REQUIREMENTS FOR SHORT TERM PROGRAM

Route	Buses Required (Peak)		Annual Bus Hours	
	Present	Proposed	Present	Proposed
Quigley-Nash)				
Barton Extension)	2	2	5,600	11,700
Queenston Road	1	2	4,100	8,900
Potruff Extension	-	3	-	12,000
Stoney Creek	1	2	4,000	7,500
TOTAL	4	9	13,700	40,100
Difference	-	+5	-	+ 26,400



EXISTING EAST END ROUTES





SHORT TERM PROGRAM FOR THE EAST END

HAMILTON TRANSIT STUDY

SERVICE IN THE CENTRAL AREA

Working Paper No.5

INTRODUCTION

The central area, below the Mountain and between the Red Hill Creek on the east and Highway 403 on the west, contains the CBD and other major business and commercial areas as well as 50% of the residential population of the City. Major radial bus routes cross the area in an east-west direction providing excellent service to the CBD. The north-south crosstown routes are of relatively less importance due to their short length and the fact that the major movements are to and from the CBD.

The proposed route changes are shown in Exhibit 1. The recommendations are as follows:

- . Operate a new development route from Upper James Street on the Mountain, via the Claremont Access, through the central area to the Burlington Street industrial area.
- . Extend the Beach route from its present terminal at Kenilworth and Barton up the Kenilworth Access to Upper Ottawa and Limeridge Road.
- . As a long-term recommendation the Barton route should eventually be linked to the Main West route.

CLAREMONT ACCESS

At the present time one peak period route; the Upper James-Crosstown, uses the Claremont Access compared with seven major routes on the Jolley Cut; two routes on Beckett Drive; and one route on the Kenilworth Access.

There are a number of reasons why the Jolley Cut is the dominant access between the Mountain and the lower City. It is the most direct route to the CBD as well as serving a number of other important destinations such as St. Joseph's Hospital. The Jolley Cut has been in use for many years and strong movements via this access are firmly established.

Looking ahead it is apparent that the Mountain accesses will become increasingly congested with resulting problems to transit. In order to reduce the concentration of trips and dependence on the Jolley Cut we propose that steps be taken to develop the use of the Claremont Access. For this purpose a new development route should be operated in conjunction with the Upper James-Crosstown route as shown on Exhibit 1. The new route would operate on an all day basis from 6:00 a.m. to midnight so as to attract regular use throughout the day.

The existing schedules of the Upper James-Crosstown and Sherman routes would be integrated with the schedule of the new route. They would continue to operate in peak period only.

It is proposed that the new route be known as the Upper James-Industrial service. The route would serve the following purposes:

1. Provide all-day service on the Claremont Access so as to stimulate regular use of that access. This can be expected to take a substantial period of time to achieve.
2. Shift some transferring from the CBD to Wellington and Victoria Streets.
3. Provide direct trips from residential areas along the route, in the central area, to destinations on the Mountain.
4. Provide direct trips from residential areas along the route, on the Mountain and in the central area, to destinations in the Burlington Street industrial area.

This service would allow a direct journey to approximately 900 trips presently being made between origins and destinations along the route.

BEACH ROUTE

The Beach route presently terminates at Kenilworth and Barton and the Bayfront route at the Kenilworth Access loop. Approximately 200 daily transfers take place between the Beach route and the Bayfront route for trips to and from points along Kenilworth Avenue. Similarly, 500 daily transfers take place between the Bayfront and Fennell routes for trips to and from the Mountain; many of these originate along Kenilworth Avenue.

It is proposed that the Beach route be extended from Kenilworth Avenue and Barton Street up the Kenilworth Access to Upper Ottawa and Limeridge as shown on Exhibit 1. This would serve the following purposes:

1. Eliminate transfers between Beach and Bayfront routes.
2. Give Beach riders one-transfer connections to the Cannon, King, Delaware, Fennell, Upper Ottawa and Upper Kenilworth routes.
3. Give direct service from points along Upper Ottawa, on the Mountain, to destinations along Kenilworth Avenue.
4. Improve access to the industrial area along Burlington Street, east of Kenilworth.
5. Increase service on the Kenilworth Access.

It is proposed that initially this route be operated in the rush hours only. It should continue to be called the Beach route.

BARTON-MAIN WEST CONNECTION

Of the 30,000 total transfers which occur on the system, some 65 percent take place in the Downtown area where 19 of the 28 HSR routes converge. There is only one significant through routing already in effect in the Downtown area. This is the connection from West Hamilton and Main Street West through to the Delaware-Rosedale and Delaware-Potruff areas. The remaining route to route transfers were examined to determine which routes could be linked to reduce transfer inconvenience.

In practice the linking of routes does create some operational problems in that the routes become longer, the exposure to potential areas of delay is greatly increased and regularity becomes more difficult to maintain. In the interests of efficiency it is also most desirable that the legs on a through route should balance east and west of the CBD. Accordingly a basic requirement was set that at least 500 daily transfers were needed to justify connecting a route; this represents one or two bus loads in the peak hours.

The heaviest single transfer movement now occurring on the system is in the Downtown area between the Barton and the Main West/West Hamilton part of the Delaware route. The number of daily transfers is about 1000. Accordingly, it is recommended that the Barton route should eventually be linked with the Main West portion of the Delaware route. This will provide through service between the west end and the central part of the lower City east of the CBD. It will supplement the Delaware route which takes care of movements in the southern part of the lower City between the east and west ends of the City.

From an operational viewpoint the best solution would be to extend the Barton trolley service along Main Street to the City limits in the west end. To balance service each second bus on the Barton route would go through to the west end.

On linking the Barton and the Main West route, the University service should be tied into the Delaware. The Delaware-Potruff and Delaware-Rosedale would then be balanced with the West Hamilton and University routes.

This recommendation is, however, not for immediate implementation. The extension of the trolley overhead is a costly matter, and sufficient trolley coaches for the service must be made available.

Inherent in this recommendation is the point that the University service should not be linked to any other route as a short-term measure.

MOUNTAIN - BAYFRONT CONNECTION

Approximately 750 transfers occur daily between routes serving the Mountain and the Bayfront route. Of these about 125 transfers could be eliminated by linking the Bayfront to the Upper Sherman route. A number of those travelling on the Upper Kenilworth, Upper Ottawa, and Upper Gage routes and transferring to the Bayfront could also be expected to use the Upper Sherman and thus avoid a transfer.

This connection, however, cannot be recommended for a number of reasons. The Bayfront is already a long route and is subject to delays in the Burlington Street area at railway crossings. Connection to a Mountain route would make it more difficult to recover lost time. Delays in the north end would have repercussions on the Mountain.

EFFECT OF PROPOSED CHANGES

Table 1 outlines the operating recommendations for the proposed Upper James-Industrial and Beach services. The effect of integrating the Upper James-Crosstown and Sherman services with the Upper James-Industrial is also shown.

Table 2 gives the operating requirements in terms of number of buses and annual bus-hours to operate these services.

Upper James-Industrial	4.0	36	20	30	30
Upper James-Crosstown	2.3	15/15	20		
Sherman	2.5	16/10	30	(11)	(12)

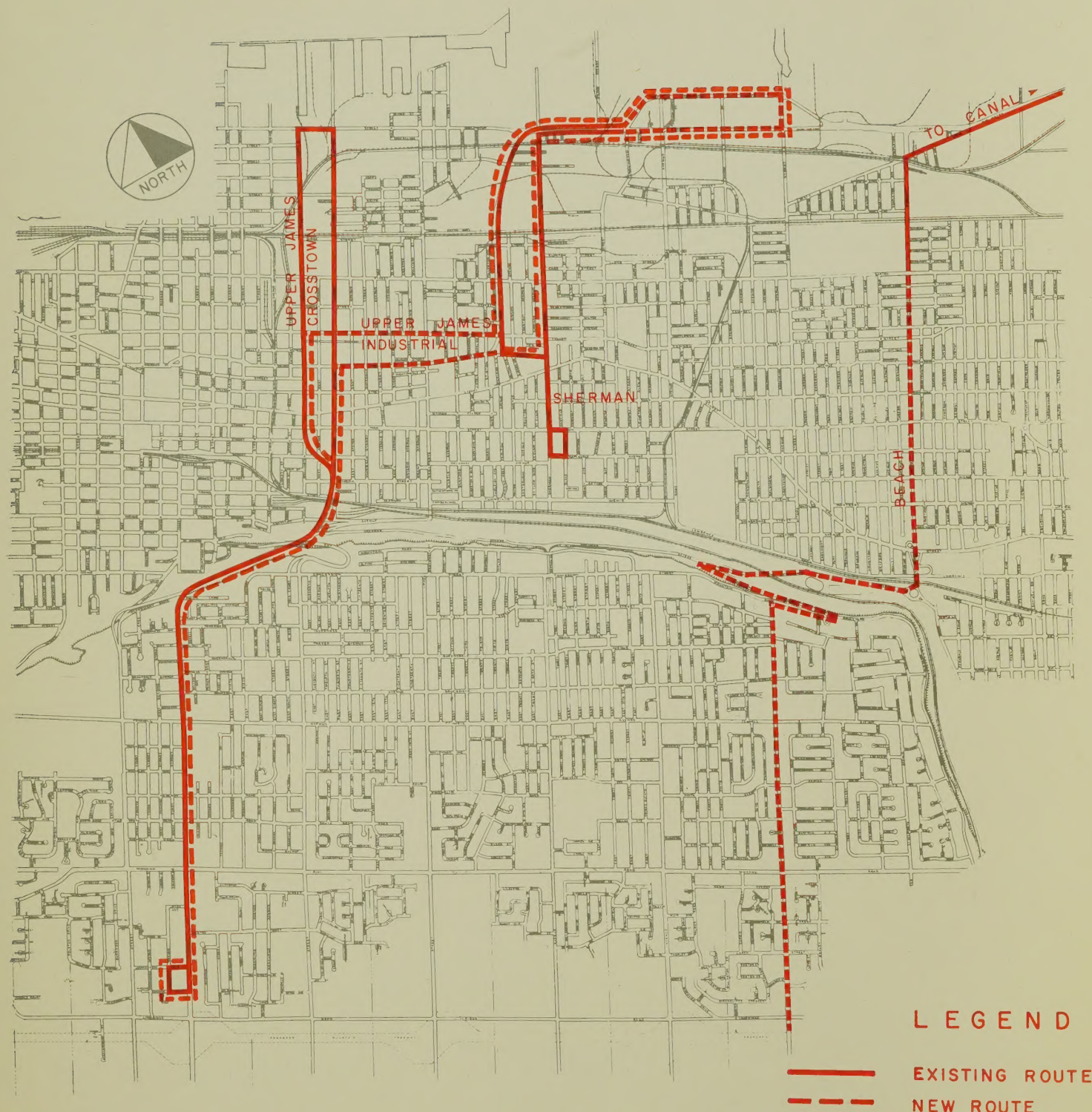
NOTE: (1) Sherman Service operates for mid-light shift change, and (2) for morning shift change.

TABLE 1

OPERATING RECOMMENDATIONS FOR PROPOSALS
IN THE CENTRAL AREA

<u>R O U T E</u>	<u>ROUTE LENGTH</u> Miles	<u>RUNNING TIME</u> Minutes	<u>HEADWAY IN MINUTES</u>				
			<u>PEAK</u>	<u>BASE</u>	<u>EVENING</u>	<u>SATURDAY</u>	<u>SUNDAY</u>
Beach	10.0	34	15	-	-	-	-
Upper James -Industrial	4.0	36	20	30	30	30	-
Upper James -Crosstown	2.3	18/19	20	-	-	-	-
Sherman	2.6	16/18	20	-	(1)	(1)	-

NOTE: (1) Sherman service operates for midnight shift change, weekdays and Saturday morning shift change.



LEGEND

- EXISTING ROUTE
- NEW ROUTE

ROUTE PROPOSALS IN THE CENTRAL AREA

HAMILTON TRANSIT STUDY

PHASE II

Working Paper No.6

INTERFACE WITH INDUSTRIES NORTH OF BURLINGTON STREET

INTRODUCTION

The major industrial concerns located north of Burlington Street occupy large tracts of land which place many jobs at relatively great distances from the nearest bus routes on Burlington Street and Industrial Drive. There are no public roads north of these streets which would allow better penetration of this area. The major employer, Stelco, operates an internal bus system moving workers from job sites to the plant gates. The object of this part of the study is to examine the interface, or lack thereof, between in-plant distribution of personnel and public bus services on Burlington Street with a view to improving the integration.

RECOMMENDATIONS

The following recommendations are made with respect to transit service in this area:

ROUTING

- . Transit service should be provided to the Wilcox Gate of Stelco either by the HSR, using Sherman route extras, or by extending the Stelco internal services to Burlington Gate.
- . An eastbound contra-flow bus lane should be introduced on Industrial Drive between Gage Avenue and Depew Streets if practicable.

(Note: Discussions with the Traffic Department, City of Hamilton indicate that this recommendation would not be practicable).

- . The Fennell route should be extended from Gage Avenue and Industrial Drive to Wilcox Street and Burlington Street.
- . Extend Beach route south on Kenilworth Avenue to Kenilworth Access loop.

SCHEDULES

- . Extend Bayfront service 4A, via Industrial Drive and Burlington Street, between the hours of 10:30 p.m. and 12:30 a.m.
- . Provide Bayfront 4A service on Saturdays, Sundays and Holidays at hours suitable for shift change.
- . Extend Fennell service to Industrial Drive until 5:30 p.m. to catch salaried workers leaving their employment after 5:00 p.m.
- . Operate one additional run on the Fennell route to depart Wilcox and Burlington at 12:20 a.m. or delay present last bus to this time.
- . Extend Sherman service until 12:20 a.m. to serve the end of the afternoon shift.

PUBLIC RELATIONS

- . Publicize the changes in service to employees in the area. Secure assistance of employers in bringing information to workers.

SURVEY OF EMPLOYERS

The area under study is located north from Burlington Street to the Harbour, east of Wellington Street and west of the Queen Elizabeth Way. Some of the Procter & Gamble plant extends south of Burlington Street, but the entire plant is included in the survey information. Similarly, some of the Dofasco offices and plants on the south side of Burlington Street are included although their plants in the Beach Road are not included.

The following industries were contacted for information on the number of employees, shifts, parking and in-plant transit systems:

Steel Company of Canada, Ltd. (Stelco)

Dominion Foundries & Steel, Ltd. (Dofasco)

National Steel Car Corporation Ltd.

Procter & Gamble Co. of Canada, Ltd.

International Harvester Ltd.

In each case full cooperation was given and a desire to assist the use of public transit was shown.

The results of the contacts with industry are tabulated in Table 1. One manufacturer asked that the information given not be circulated to the public.

The provision of parking is a major problem and expense to each company. Land in the area is at a premium and in some cases expansion of manufacturing facilities is being inhibited through lack of building sites. Nevertheless none of those contacted had any plans to reduce the amount of parking presently available. There was a general feeling that any threat to reduce parking would result in strong protests from their employees.

At least two of the respondents were skeptical that any increase in the percentage of workers using public transit could be achieved. The Stelco representatives noted that an express service was operated from the Wilcox Gate, five or six years ago, but failed because of lack of patronage. The International Harvester representative was of the opinion that since journey times by car were short, and free parking was available, there was little chance to attract car users to transit.

Dofasco and International Harvester each operate a limited in-plant service with a small number of vehicles. These are for medical and maintenance services and are not for the purpose of moving large numbers of employees at shift changes. Stelco is the only industry operating an extensive in-plant transit service.

Most firms report that work hours are staggered. This is accomplished in a number of ways:

- a) Varying times for shift change as set by the company.
- b) On-the-job relief. Worker on the following shift can report up to one hour before shift change and the relieved worker is then free to go home.
- c) Different travel times inside the plant. Workers at points remote from the gates take longer to reach the exit point than those employed adjacent to the gate.
- d) Varying arrival habits. Some workers arrive well before the shift change, although few remain after the shift change.

This staggering is beneficial in reducing congestion in the parking lots and on the roads, but creates difficulty in establishing specific times for scheduling bus services. There is no specific time when large numbers of employees can be picked up for limited stop on express services.

TABLE 1

RESPONSES FROM INDUSTRY

COMPANY	WORK FORCE			Parking Spaces	In-Plant Transit	COMMENTS
	Day	Evening	Night			
Stelco (Hilton Works)	8000	3150	2950	4600	Yes	Long walk from Burlington Street to Wilcox Gate is major source of complaint.
Dofasco *	1400	400	400	2000	Limited Service	Long walk from Kenilworth and Beach to Bayfront Gate. Scheduling could be improved at shift changes. Express buses would be a benefit.
International Harvester	1960	270	69	2500	Limited Service	Service to surrounding areas by routes making good connections. Schedules could be improved at shift changes. Doubt public transit will attract many users while free parking is offered.
Procter & Gamble	734	127	59	545	No	Timing is not convenient. More cross-town routes needed. More Fennell Service to Burlington Street required. Bus shelters required. Express services required to centre and to Mountain. Sign bus areas to show hours of operation on route.
National Steel Car	1600	600	100	Not Given	No	No Comments

* Dofasco employs another 5700 employees and provides another 1600 parking spaces in the Beach Road area.

ANALYSIS

From the information supplied by the employers in the area the total employment has been estimated as shown in Table 2. This information is also shown graphically on Figure 1. The estimate of employment is based on figures from the major employers plus an estimate of the numbers employed by the smaller industries.

TABLE 2
EMPLOYMENT NORTH OF BURLINGTON STREET

<u>EMPLOYER</u>	<u>S H I F T</u>		
	<u>Day</u>	<u>Evening</u>	<u>Night</u>
Stelco			
- Wilcox Gate	3,900	1,200	1,100
- Burlington Gate	1,650	900	850
- Gage Gate	1,450	500	500
- Depew Gate	1,000	550	500
Dofasco**	1,400	400	400
International Harvester	1,950	270	70
National Steel Car	1,600	600	100
Procter & Gamble	750	130	60
Others	1,300	450	420
T O T A L S	15,000	5,000	4,000
Percent of all shifts	62.5	20.8	16.7
<u>TOTAL ALL SHIFTS*</u>		<u>24,000</u>	

* Not including weekend shifts

** Dofasco employs another 5,700 people in the Beach Road area.

Table 3 lists the amount of parking made available for employees by the industrial firms located north of Burlington Street. Parking provided by "others" is estimated.

TABLE 3

PARKING SPACES AND AREA

	<u>Number of Spaces</u>	<u>Number of Acres</u>
Stelco	4,600	37.0
Dofasco*	2,000	15.5
International Harvester	2,500	17.5
National Steel Car	800	6.0
Procter & Gamble	500	3.5
Others	<u>1,800</u>	<u>12.5</u>
T O T A L	<u><u>12,200</u></u>	<u><u>92.0</u></u>

* Dofasco have another 1,600 parking spaces in the Beach Road area.

Table 4 shows the geographical distribution of employees residences. This information is based on a survey by Stelco of their own employees. The results of the Stelco survey have been assumed to be typical for all industry in the area.

TABLE 4
DISTRIBUTION OF EMPLOYEES' RESIDENCES

<u>Location</u>	<u>Percent</u>	<u>Number</u>
Hamilton (within city limits and below mountain)	48%	11,500
Hamilton (within city limits and on mountain)	25%	6,000
Burlington, Bronte, etc.	10%	2,400
Stoney Creek, Grimsby, etc.	8%	1,900
Dundas and Ancaster, etc.	4%	1,000
South of Hamilton, Mount Hope, Caledonia	5%	1,200
	<u>100%</u>	<u>24,000</u>

Table 5 is derived from the Bus Passenger Survey and shows the distribution for those travelling by public transit to and from the industrial area north of Burlington Street.

TABLE 5
ORIGINS AND DESTINATIONS OF
INDUSTRIAL AREA TRANSIT TRIPS

<u>Point of Origin or Destination</u>	<u>Trips to Industrial Area</u>	<u>Trips from Industrial Area</u>	<u>Percent of Total</u>
Hamilton (within city and below mountain)	1,227	1,109	74.9
Hamilton (with city and on mountain)	380	365	23.8
Burlington, Bronte	2	None	0.1
Stoney Creek, Grimsby	6	10	0.5
Dundas, Ancaster	13	8	0.7
South of Hamilton	None	None	0.0
TOTAL	<u>1,628</u>	<u>1,492</u>	<u>100.0</u>

From employment figures and the Bus Passenger Survey, the number of trips by public transit expressed as a percentage of the trips by all modes is shown in Table 6 for the Industrial Area.

TABLE 6
TRIPS BY PUBLIC TRANSIT AS A
PERCENTAGE OF TRIPS BY ALL MODES

<u>Origin or Destination</u>	<u>Number of Trips by All Modes</u>	<u>Number of Trips by Public Transit</u>	<u>Percent</u>
Hamilton (within city and below mountain)	23,000	2,336	10.1
Hamilton (within city and on mountain)	12,000	745	6.2
Burlington, Bronte	4,800	2	Insignificant
Stoney Creek, Grimsby	3,800	16	0.4
Dundas, Ancaster	2,000	21	1.0
South of Hamilton	2,400	None	0.0
<u>O V E R A L L</u>	<u>48,000</u>	<u>3,120</u>	<u>6.5</u>

EXISTING TRANSIT SERVICES

The existing bus routes serving the industrial area are shown on Figure 1 together with the location of various groups of employees. A description of the routes follows:

The Bayfront route is the most important carrier accounting for 1283 of 1492 public transit trips out of the industrial area. The Bayfront carries trips to the city centre where transfers can be made to the west end and the Mountain. In the east the route follows Kenilworth Avenue to the Kenilworth Access loop.

The Bayfront operates 20 hours each day of the week. The routing is split between Route 4, via Grenfell, Beach and Gate and Route 4A, via Industrial Drive and Burlington Street. Route 4A operates from about 6:00 to 8:00 a.m. and 1:40 to 5:30 p.m. on a 14-minute headway, a single westbound bus serves the area at about 12:45 p.m. There is no weekend service on Route 4A.

Route 4A serves Dofasco, Procter & Gamble and Stelco workers from the Gage and Depew gates. Workers from these locations are more than a quarter-mile from Route 4. The operating hours of Route 4A are satisfactory for the day shift, but for the evening shift they do not provide a satisfactory timing for the return journey and for the night shift the timing is not satisfactory for the journey to work. No service is provided for approximately 2700 weekend shift workers employed at these points.

Since Burlington and Industrial form a one-way pair from just west of Kenilworth to just west of Wilcox, the Bayfront is routed eastbound over Burlington and westbound over Industrial Drive within these limits. The service to the area north of Burlington Street is therefore limited by the one-way pair which forces the eastbound movement 1000 feet south of the Stelco gates at Depew and Gage Avenue.

This walk undoubtedly discourages a number of potential riders particularly considering the fact there are large travel distances within the plant. The possibility of introducing a contra-flow eastbound 'bus only' lane on Industrial Drive between Gage and Depew should be investigated.

The Fennell route carried 142 trips out of the industrial area on the survey day. The Fennell is routed by Ottawa Street and the Kenilworth Access to destinations on the Mountain. The Fennell route serves the industrial area from 6:00 to 8:30 a.m., 2:00 to 4:45 p.m. and from 10:30 to 12:10 p.m. on weekdays, a limited service is provided on Saturdays, Sundays and Holidays. At other times the Fennell route turns back at Ottawa and Beach Road.

The Fennell service to the industrial area loops via Ottawa, Industrial, Gage and Burlington. This loop serves the Depew and Gage gates of Stelco and Procter & Gamble. The timing is satisfactory for the day shift workers. Salaried workers are unlikely to be attracted to the Fennell route because they finish work at 4:45 p.m. just as the last afternoon Fennell bus departs. Most salaried workers are located at the Wilcox Gate however.

The 12:10 p.m. departure of the last Fennell from Industrial and Gage will be a problem for a number of workers on the afternoon shift who finish work at 12:00 p.m. and have a substantial journey inside the plant.

The Sherman route was shown to be carrying 46 trips from the industrial area. Its terminal at Wilcox and Burlington places it within a quarter-mile scope for only those employed at the Burlington gate of Stelco and the International Harvester plant.

The operating hours of the service are 6:00 to 9:00 a.m., 2:00 to 6:00 p.m. and 10:00 to 11:30 p.m. These hours serve the day and night shift

workers as well as salaried workers, but a portion of the afternoon shift complete work after 11:30 p.m. and will be unable to use the Sherman for the return journey.

The Sherman service also operates Saturday morning from 6:00 until 9:00 a.m. This service provides for the return journey of night shift workers and delivers Saturday day workers to the industrial area, but does not provide for the return journey. No Sunday or Holiday service is provided.

The Beach and Burlington routes serve the area north of Burlington Street and east of Kenilworth. These routes are, however, showing only 14 trips out of the area.

The Beach service operates in the morning and evening rush hours only at headways varying between 9 and 24 minutes. The Burlington service operates on a base one-hour service all day including Saturdays, Sundays and Holidays.

The Beach service terminates at Barton Street and does not give a direct connection to the other major east-west routes nor a connection to the Fennell route for trips onto the Mountain.

The Beach route cannot be used by the evening, night and weekend shift workers. A one-hour service on the Burlington route is probably unsatisfactory to a large number of hourly workers whose starting and stopping times vary from day to day.

A small number of workers apparently make their way on foot from the industrial area to catch a bus at Barton Street. The single major point of employment in the industrial area is the Wilcox gate located 2000 feet north of Burlington Street. This gate is beyond the scope of any transit service.

PROPOSED TRANSIT SERVICES

It is proposed that the following changes be made in the transit services serving the industrial area:

1. The internal Stelco service to the Wilcox gate should be extended southerly on Wilcox Street to Burlington Street.
2. Provide Bayfront 4A service via Industrial Drive and Burlington Street, between the hours of 10:30 p.m. and 12:30 p.m.
3. Provide Bayfront 4A services on Saturdays, Sundays and Holidays at hours suitable for shift change.
4. Investigate the use of a contra-flow bus lane for Bayfront service on Industrial Drive between Gage and Depew.
5. Extend Fennell service from Gage Avenue on Industrial Drive to Wilcox Street before turning back along Burlington Street.
6. Operate Industrial Drive service on Fennell route until 5:30 p.m. to catch salaried workers leaving after 5:00 p.m.
7. Operate one additional run to depart Wilcox and Burlington at 12:20 p.m. or delay present last bus to this time.
8. Extend Sherman route east on Burlington, north on Ottawa and west on Industrial Drive.

9. Provide Sherman runs until 12:20 p.m. to serve the end of the afternoon shift.
10. Extend the Beach service to the Kenilworth access so as to give direct connection to Cannon, King, Delaware and Fennell routes as well as the Barton route.
11. Increase the rush hour frequency of the Beach service.

The main purpose of these proposals is to bring the bus routes within acceptable walking distances from the plant gates at times matching shift changes. Table 7 shows that these changes would place some 8,000 more employees within scope of bus service. This could produce up to 2,600 additional daily trips in and out of the industrial area, based on the trip generation experienced with in-scope employees at present. These trips, if realized, would produce added revenue of \$160,000. Table 7 compares the number of workers within the scope of the existing routes with those that would be in scope with proposed routes. From the trips generated by the existing routings and timings the potential trips are estimated by the larger number of employees within the catchment area of transit service.

The main increase in riders would be secured from the Wilcox gate of Stelco which is at the present time beyond acceptable walking distance to public transit. It is proposed that the in-plant service be extended to Burlington gate which is well served by public transit. The Stelco service is operated by a contractor who does not have a charter to operate on public streets. The proposed service is therefore restricted to Stelco property.

Publicity should be given to the changes in routing and timetables. The assistance of the industrial companies in the area should be secured to make their employees aware of the improvements in transit.

Costs for the above proposals will be developed by HSR.

TABLE 7

EMPLOYEES SERVED BY EXISTING
AND PROPOSED TRANSIT SERVICES

ROUTE	LOCATION	E X I S T I N G		P R O P O S E D		Increase In Trips One Way
		In Scope Employees	Trips Generated Outbound	In Scope Employees	Indicated Trips Generated Outbound	
BAYFRONT	<u>Stelco</u>					
	Wilcox Gate	-		6,200		
	Burlington	3,400		3,400		
	Gage	2,450		2,450		
	Depew	1,000		2,050		
	Int. Harvester	2,290		2,290		
	Dofasco	1,400		2,200		
	Proctor & Gamble	750		940		
	N.S.C.	-		-		
	Others	700		700		
	TOTAL	11,990	1,283	20,230	2,163	880
FENNELL	<u>Stelco</u>					
	Wilcox Gate	-		6,200		
	Burlington	-		3,400		
	Gage	2,200		2,450		
	Depew	1,800		2,050		
	Int. Harvester	-		-		
	Proctor & Gamble	940		940		
	Dofasco	-		-		
	N.S.C.	-		-		
	Others	-		-		
	TOTAL	4,940	142	15,040	432	290

TABLE 7 (Cont'd)

ROUTE	LOCATION	E X I S T I N G		P R O P O S E D		Increase In Trips One Way
		In Scope Employees	Trips Generated Outbound	In Scope Employees	Indicated Trips Generated Outbound	
SHERMAN	<u>Stelco</u>					
	Wilcox Gate	-		6,200		
	Burlington	2,950		3,400		
	Gage	-		2,450		
	Depew	-		2,050		
	Int. Harvester	2,150		2,290		
	Proctor & Gamble	-		940		
	Dofasco	-		2,200		
	N.S.C.	-		-		
	Others	-		-		
TOTAL		5,100	46	19,530	176	130

LIMITED STOP AND EXPRESS SERVICE
TO THE INDUSTRIAL AREA

Criteria for considering the operation of a limited stop or express bus service has been established as follows:

1. Sufficient present trips in the peak to fill two buses
i.e. 120 trips.
2. The trip should be 30 minutes or more with the present service.
3. The average speed on the overall trip at present should be 10 mph or less.

All of these conditions should be present.

Table 8 shows the origins of trips to the industrial area in the 7:00 to 9:00 a.m. peak travel period.

TABLE 8
TRIPS TO INDUSTRIAL AREA
7:00 TO 9:00 A.M.

<u>Origin</u>	<u>Number of Trips to Industrial Area</u>
City below Mountain	
East End	56
Central	135
West End	72
City on Mountain	56
Burlington	<u>2</u>
T O T A L	321

From examination of Table 8, only the central residential area below the Mountain meets the criteria for two bus loads in the peak period and this area is already served by existing routes. Travel time by transit is well under 30 minutes.

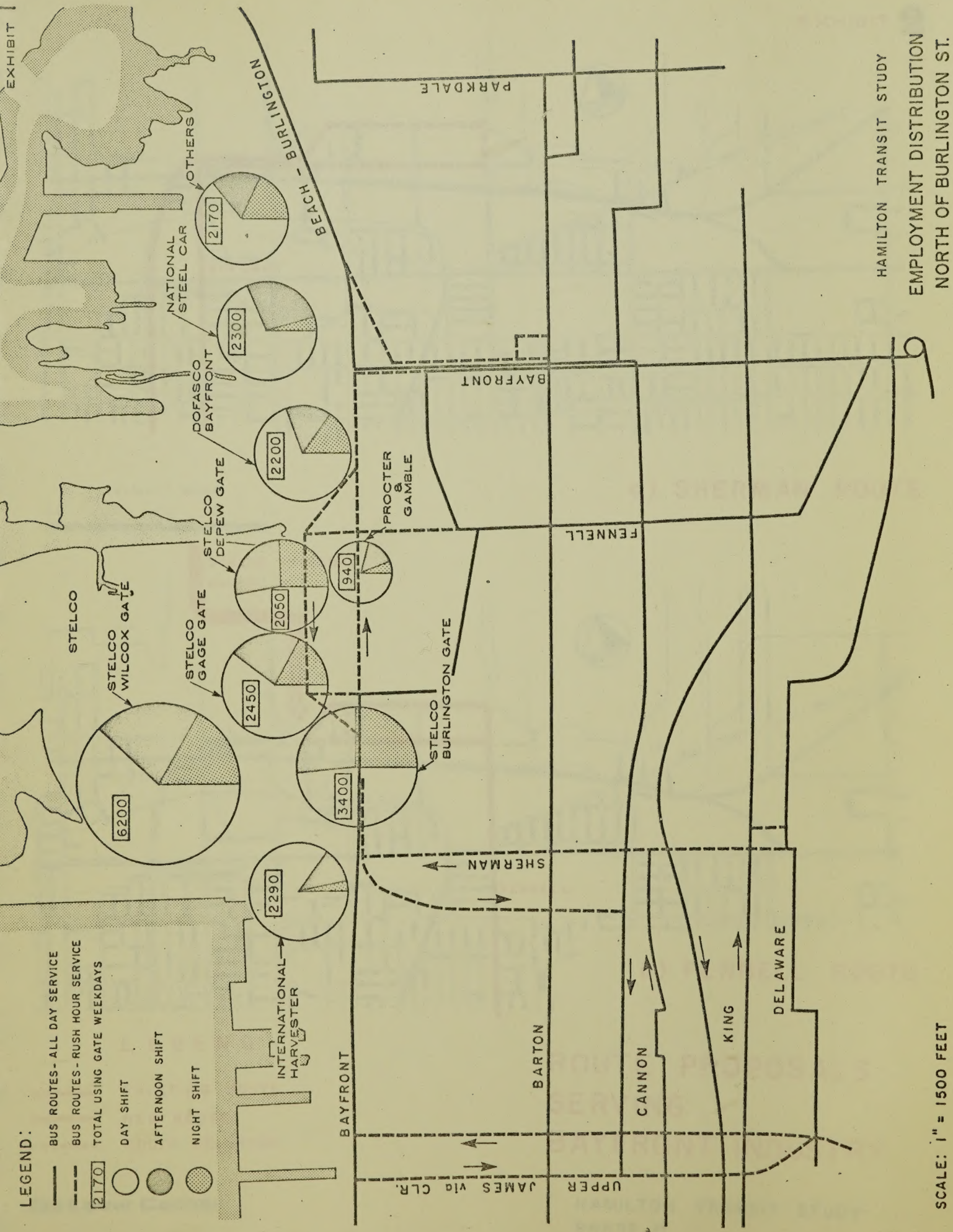
The home location of employees in the east and west ends, and on the Mountain, are very widely dispersed and there is not sufficient traffic from any one area at one time to justify a direct bus service for industrial employees.

Travel speeds generally exceed 10 mph except in a number of trips where multiple transfers are required.

None of these travel patterns meets the criteria for either limited stop or express bus service. These types of services to the industrial area should not be considered at this time. In the future this matter should be reviewed from time to time to determine if travel demand has changed sufficiently to warrant the introduction of special services.

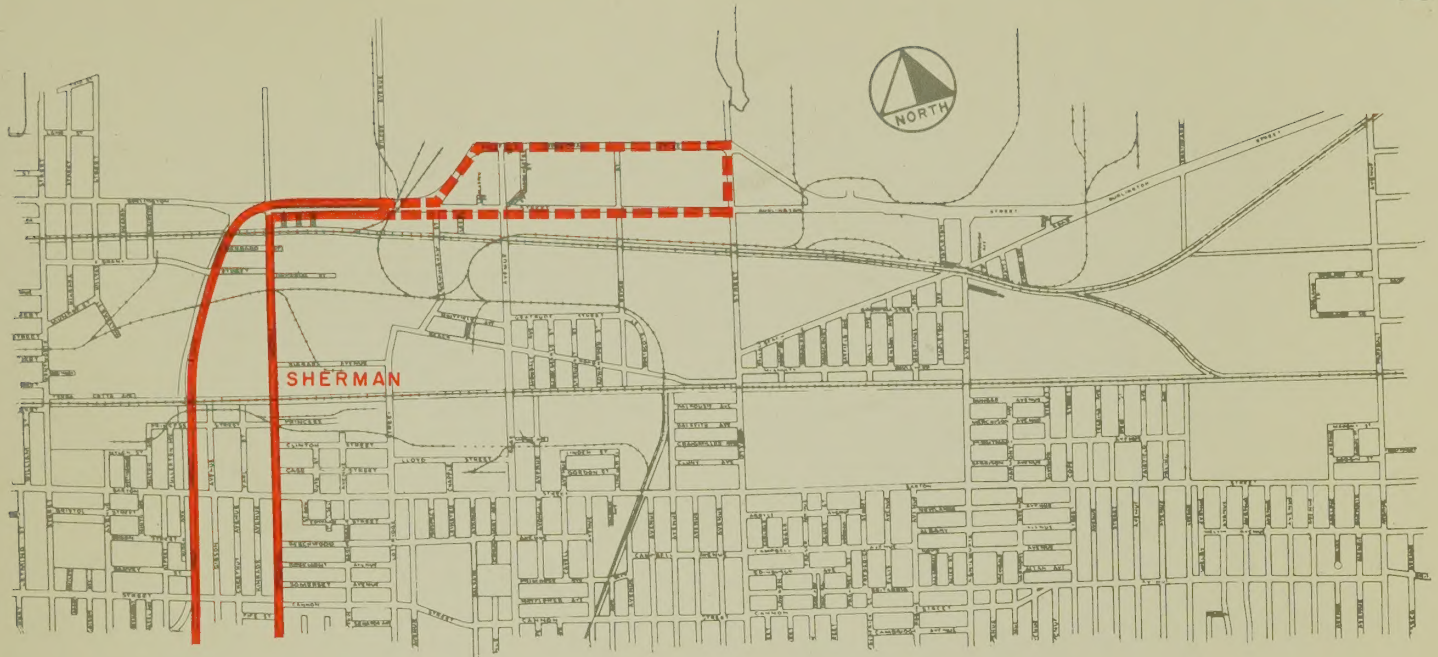
LEGEND:

- BUS ROUTES - ALL DAY SERVICE
- BUS ROUTES - RUSH HOUR SERVICE
- TOTAL USING GATE WEEKDAYS
- DAY SHIFT
- AFTERNOON SHIFT
- NIGHT SHIFT

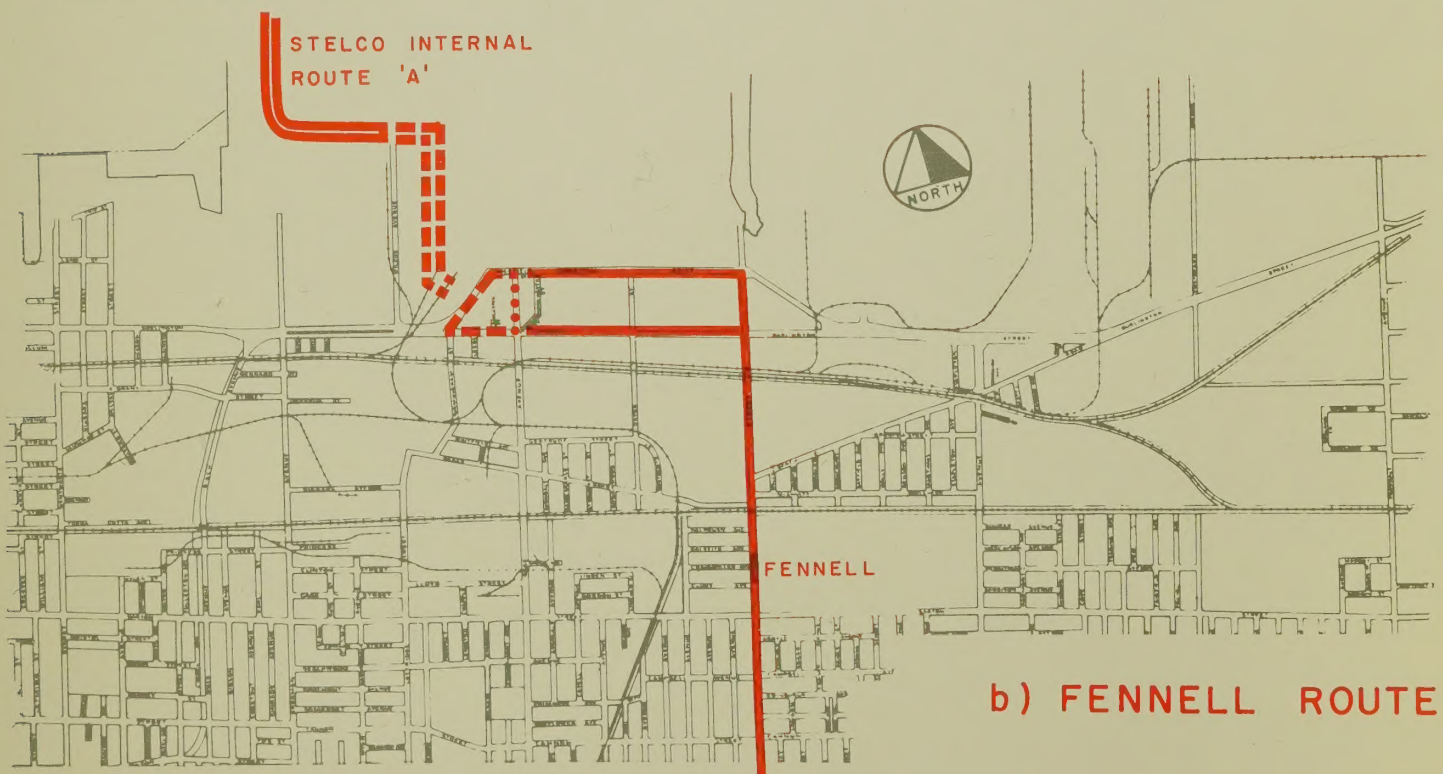
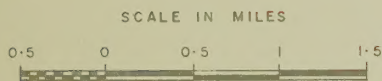


HAMILTON TRANSIT STUDY
EMPLOYMENT DISTRIBUTION
NORTH OF BURLINGTON ST.

SCALE: 1" = 1500 FEET



a) SHERMAN ROUTE



b) FENNEL ROUTE

LEGEND

- EXISTING ROUTE
- - - NEW ROUTE
- ROUTE DELETION

ROUTE PROPOSALS
SERVING
BAYFRONT INDUSTRY

HAMILTON TRANSIT STUDY

PHASE II

NEEDS OF THE HANDICAPPED

Working Paper No.7

INTRODUCTION

Discussions on the subject of providing for the requirements of the handicapped have been proceeding between various handicapped associations and the HSR for some time. The Consultants have been asked to further investigate these needs and make a listing of the major requirements, cost estimates of those items which may best be accomplished through actions of the HSR and suggestions as to which agencies might be approached for further review of matters beyond the scope of the present study.

This report has been prepared on the basis of meetings and correspondence with representatives of handicapped associations together with review of literature on the subject.

The definition of handicapped is not precise and the numbers included vary widely from source to source. In some cases only those who have a physical handicap are included, while in other cases the chronically ill are included. Depending on definition, the numbers involved vary from 3% to 12% of the population. It would seem reasonable to include the chronically ill in the group whose needs should be examined; accordingly this has been done in the study.

SUMMARY AND CONCLUSIONS

In summary, the primary role for public transit is to provide safe, fast, convenient and efficient transportation for the general public. This function cannot be ignored in determining how the public transit system

can serve the handicapped. The handicapped, however, have very real problems in terms of transportation and there is a cost to the community as well as the individuals in not meeting these needs. Transportation is necessary for employment, shopping and recreation as with the general population, but the handicapped have, in many cases, the additional need for therapeutic treatment and special training. In some cases, the lack of suitable transportation is a bar to employment and training and the only recourse is welfare. Therapeutic treatment on an out-patient basis may be impossible to reach and the condition deteriorates until the person is hospitalized, at added cost to the community.

There are no dramatic steps that can be taken to make it possible for all categories of handicapped to use public transit vehicles. It is, however, possible to improve conditions for a significant number by means of a few simple steps.

Those handicapped who cannot use public transit would benefit from coordination of special transit services offered by various agencies, hospitals and associations.

The conclusions reached are:

- . that meeting the needs of the handicapped is a community problem and the costs should be met by the community.
- . that general improvements to transit operations are of significant benefit to the handicapped.
- . that the handicapped would benefit from training in the use of public transit.

- . that the handicapped should have priority in the use of one or both front seats on public transit vehicles.
- . that a comprehensive study of the needs and numbers of handicapped be carried out before policy decisions are taken by the City or the Commission.
- . that transportation services being offered by various associations and agencies, for those unable to use public transportation, should be coordinated.
- . that responsibility for providing special transportation services should remain with the public, private or voluntary agencies.
- . that one of the public health or welfare agencies should accept responsibility for preparing and maintaining, on a full-time basis, a registry of handicapped requiring transportation and transportation services available.

NUMBERS OF HANDICAPPED INVOLVED

Information on the number and location of handicapped people with special transportation needs is relatively unknown. The agencies and associations contacted were unable to provide information on the overall problem, but they did make it clear that they are unable to meet present demands for transportation of the handicapped. They also expressed the opinion that there are a large number of cases of transportation need which did not come to their attention. The figures given below are therefore general estimates based on national averages.

The Ontario Department of Health has produced: "An estimate of the number of persons with handicapping conditions, Ontario, 1969". This report is

based on the findings of the U.S. National Survey, 1963-1965 and the Canadian Sickness Survey, 1950-1951. For Ontario the total number of persons estimated to have either a permanent physical disability or a year-long sickness is 12.2 percent of the total population. For the City of Hamilton this would represent 36,000 people. Table 1 gives "An estimate of the number of persons with one or more chronic conditions, by selected chronic conditions and activity limitation status, for Hamilton". This is based on the Ontario figures factored by the relationship between the City of Hamilton population and that of the Province as a whole.

It is recognized that not all of these handicapped would experience difficulty in using public transit, others have a private car available and still others, unfortunately, are unable to use public transit under any conditions.

From, "Rehabilitation Services in Hamilton and District", it is estimated that 1.5% of the population "have trouble getting around", 0.9% "need help in getting around", and 0.7% are "confined to the house". For the City of Hamilton these percentages give the following numbers:

Have trouble getting around	4,500
Need help getting around	2,700
Confined to home	2,100

These figures represent 9,300 out of the total of 36,000 in Hamilton who, it is indicated, are suffering some form of disability. It can be assumed that 16,700 have varying degrees of difficulty in the use of public transit, although it may not be readily evident.

As a group, the handicapped rely heavily on public transit. Because of their handicap they may be unable to use a private car and because incomes are frequently lower, they are more likely to depend on public

TABLE 1.

SELECTED CHRONIC CONDITIONS

HAMILTON

	All degrees of activity limitation	Limitation but not in major activity	Limitation in kind or amount of major activity	unable to carry on main activity
Mental and nervous conditions	2,800	680	1,480	680
Neoplasms	800	150	350	300
Heart conditions	5,800	1,040	3,080	1,640
Circulatory conditions	4,300	960	2,400	920
Varicose veins	900	240	480	80
Respiratory Conditions	3,800	1,150	1,850	850
Arthritis and rheumatism	5,600	1,200	3,320	1,080
Digestive conditions	3,700	750	2,100	800
Disease of muscles, bones, joints	1,300	360	760	120
Genito-Urinary conditions	1,700	480	920	320
Visual impairments	2,000	280	1,000	760
Hearing impairments	750	160	360	240
Paralysis, complete or partial	1,500	200	560	720
Impairments of back or spine	2,800	760	1,800	240
Impairments of upper extremities	650	150	400	100
Impairments of lower extremities	2,100	640	1,120	360
Persons limited in activity	36,000	10,000	20,000	6,000

N.B. Summation of conditions causing limitation may be greater than number of persons limited, because a person can report more than one condition as a cause of limitation.

transit. Nevertheless, it has been found that those with mobility problems restrict their travel to essential trips and as a group take only half the number of trips taken by the general public. For Hamilton approximately 100 public transit trips per year per capita are made by the general population. The handicapped can be assumed to take an average of 50 public transit trips each per year.

The handicapped have been found to locate in areas close to their work places, hence work trips tend to be relatively short. They do not necessarily locate residences in areas of high transit accessibility, apparently using the same criteria as the non-handicapped for locating residences.

It has been noted that the handicapped avoid travelling when vehicles are crowded and therefore they generate a high proportion of off-peak trips. They often go to work very early so as to avoid crowds.

TRANSPORTATION NEEDS OF THE HANDICAPPED

The members of the community who are handicapped face many problems in using public transit. The major problems are:

1. Many handicapped have difficulty in maintaining balance during acceleration, braking or swerving of the vehicle.
2. Many have difficulty negotiating bus steps, narrow aisles and standard bus seating.
3. Many handicapped are unable to cope with crowds. They cannot stand jostling and frequently are acutely aware and embarrassed if their slow movements delay others.
4. The problem of walking to the bus stop inhibits many transit trips by the handicapped.

5. Some categories of handicapped people are unable to cope with the mental stress of a transit ride particularly where a transfer or a choice of services is involved.
6. The handicapped are more susceptible to fatigue and exposure, in waiting for a bus and on a long trip, than are the general public.

THE ROLE FOR PUBLIC TRANSPORTATION

The primary role for public transit is to provide safe, fast, convenient and efficient transportation service for the general public. This function cannot be ignored in determining how the public transit system can serve the handicapped. In addition, passenger safety is essential and handicapped persons should not be encouraged to use regular public transit services if they are in danger of injury while boarding, alighting or moving inside the vehicle. Their ability to get to and from the bus stop safely and without danger to health is also an important consideration. However, having made these cautionary remarks, we believe that there are a number of features which can be introduced into public transit services which would substantially improve their capability to handle handicapped passengers. These are listed below in order of the relative ease with which they can be introduced on a system-wise basis by the Hamilton Street Railway.

1. Carry out improvements in general transit service which benefit the general public and also benefit the handicapped. Elimination of transferring, faster more direct services, reduced waiting times, simplification of routes, availability of travel information, bus shelters and benches at stops are significant steps in meeting some of the needs of the handicapped.

2. Provide general information, on request, as to available routes and schedules as well as safe practice in boarding, alighting and moving in the vehicle.
3. Encourage handicapped associations and training agencies to include instruction in the use of public transit in their programs, where appropriate. The HSR could assist these programs by making a vehicle and operator available.
4. Provide technical advice to other agencies operating special transit services for the handicapped, on operating methods, dispatching, equipment purchase and vehicle maintenance.
5. Set aside one or more of the front seats on each bus for priority use by the handicapped. These seats to be signed:

Reserved for the Handicapped.

Please give up to a Handicapped Person.

The cost to do this would be not more than \$10 per vehicle.

6. Install grab bars, stanchions or seat arms where required to enable the handicapped to use a convenient handhold at all times when moving between the door of the vehicle and the priority seats reserved for their use. The cost to do this will vary by vehicle, but this should not exceed \$250 to \$300 per vehicle.

7. Enter into agreements with other agencies to provide reserved bus services for the handicapped. This is particularly applicable at off-peak times when surplus vehicles and perhaps crews can be utilized.
8. Explore the feasibility of providing special equipment on selected vehicles to handle the handicapped services referred to above, e.g. wheelchair ramps and clamps on mini-bus vehicles, portable steps.
- 9.. Encourage senior government to develop new types of transit vehicles which are more convenient for the handicapped. This is being actively explored by the U.S. Department of Transportation and findings are being made available on a continuing basis to the Canadian Transit Association. The main areas being considered include lower steps, improved door layouts, handholds and seat design.

SPECIAL TRANSPORTATION SERVICES FOR THE HANDICAPPED

It is apparent that there is a large percentage of the handicapped population who will be unable to use public transit under any circumstances. This group presently rely on friends, family or handicapped associations for transportation. Where this is not available they are excluded from travel for employment, shopping, recreation, training and treatment. In these circumstances the handicapped can be unwillingly thrown on the welfare rolls, become depressed due to lack of recreation, not receive necessary training or their condition can deteriorate due to lack of access to treatment. Special transportation services are required to complement public transit improvements for the handicapped.

A great deal of good and constructive work is now being done by voluntary organizations, welfare agencies and hospitals in providing transportation for the handicapped. However, until recently, there has been a lack of coordination between the various agencies involved, and factual information of a comprehensive nature on the transportation requirements for the handicapped is not readily available. In addition there is a lack of comprehensive information available to the handicapped on the special transportation services available to them.

Current studies, by De Leuw Cather, Canada Ltd., in London and Ottawa, as well as Hamilton, have brought out the urgent requirement for a program to coordinate transportation services for the handicapped in each community.

The primary responsibility for the handicapped must rest with health and welfare agencies as well as with the various handicapped associations. Medical and welfare requirements are primary and transportation is secondary to these main factors. Thus transportation services must be organized through the agencies and with their full cooperation.

The following proposal can serve as a guideline for a program to coordinate transportation services for the handicapped:

1. Public health and welfare agencies should be responsible for preparing and maintaining a registry of transportation requirements for the handicapped in Hamilton and the transportation services which are available. These agencies are the logical ones for the public to contact when seeking information. They can provide continuity and staff reserves to maintain comprehensive records and to provide information which is now carried out by various organizations mainly on an individual or ad hoc basis.

2. A standard application form should be prepared with the co-operation of the appropriate federal and provincial agencies and associations with an interest in the handicapped.
3. Criteria should be developed, again potentially for national and provincial use, to assist the local agency to determine the type of transportation which is recommended for various categories and degrees of disabilities. The criteria would be developed by medical specialists to insure that the capabilities of the handicapped are thoroughly understood and safe practices are adopted.
4. The central registry should obtain complete information from the public, private and voluntary agencies on the transportation services they can provide for the handicapped in terms of geographic coverage, hours of service, nature of equipment and suitability for various categories of handicapped persons.
5. The registry would be initiated by requesting the handicapped who desire transportation services to contact the designated agency so that they may obtain an application form and information on the services available to them.
6. The registry would make a preliminary assessment of the type of transportation required and turn the application, if acceptable, over to the registered transportation service which is best equipped to meet the need. The applicant would be advised of this action and obtain an identity card, designating the recommended type of transportation service to meet his or her needs. In some instances, of course, medical examination may be necessary to determine the safe and appropriate form of transportation needed.

7. The registered transportation service would then notify the applicant of the service available to him and arrange for any special instruction as to the best method to use the service in terms of safety and booking requirements.
8. Any coordination of efforts should take place directly between the agencies themselves and could include joint dispatching, purchasing, maintenance, and sharing of vehicles.

ORGANIZATIONS

In any ongoing work on transportation services for the handicapped reference can be made to the following agencies. This list is not comprehensive, but includes a representation of organizations and agencies interested in or actually operating transportation services for the handicapped:

Handi-Transit Committee
Amity Rehabilitation Centre
Chedoke Hospitals
Multiple Sclerosis Society
Society for Crippled Children
St. Matthew's House
Canadian Cancer Society
Canadian National Institute for the Blind
Muscular Dystrophy Association
War Amputations of Canada
Social Planning and Research Council
Canadian Cystic Fibrosis Foundation
The Hamilton Handicap Club
Children's Aid Society
Catholic Children's Aid Service

Family Service Agencies

United Appeal

Hamilton Council of Associated Service Clubs

Hamilton Health Association

Retarded Adult Training Centre

Association for the Mentally Retarded

Canadian Mental Health Association

City of Hamilton

- Department of Social and Family Services
- Department of Welfare

Board of Education for the City of Hamilton

Hamilton-Wentworth Catholic Board of Education

Government of Ontario

- Vocational Rehabilitation Services
- Ministry of Community and Social Services
- Ministry of Transportation and Communications

Transportation Development Agency.

REFERENCES

1. "An estimate of the number of persons with handicapping conditions Ontario, 1969", by the Ontario Council of Health Supplement No.6, 1970, Ontario Department of Health.
2. "Transportation needs of the handicapped: travel barriers", by Abt Associates Incorporated, Cambridge, Massachusetts, August 1969. U.S. Department of Commerce/National Bureau of Standards.
3. "Rehabilitation Services in Hamilton and District", by the Social Planning and Research Council of Hamilton and District, May 1971.

4. "Transportation for the Handicapped in Hamilton District",
Social Planning and Research Council.
5. "Handi-Transit, inter-agency cooperation to meet a community
need", Social Planning and Research Council, March 1973.

HAMILTON TRANSIT STUDY

PHASE II

DIAL-A-RIDE AND PARK-AND-RIDE

Working Paper No.8

INTRODUCTION

The Terms of Reference for Phase II of the Hamilton Transit Study included the following task:

"A conceptual study is required within the communities served by the system to select an area suitable for a Dial-A-Ride or a Park-And-Ride experiment"

It was agreed that this work would be based on experience gained from other locations in Canada and the United States. Criteria would be established for selection of test areas to experiment with dial-a-ride or park-and-ride. The most promising suburban areas for further service studies would be identified.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Hamilton Street Railway Company, as a matter of policy, has provided fixed route service to each new area within the City as it has developed. As a result there are no areas of any significance ~~with-~~ in the City without service.

Similarly Stoney Creek, Dundas and Ancaster are served by HSR services which do not, however, penetrate all of the residential areas of those municipalities.

The suburban areas of Hamilton and the surrounding municipalities are also served by Canada Coach Line routes which provide local

services outside the City and express services to the centre of Hamilton.

Where traffic is concentrated a fixed route operation offers the best service at an economical cost. However, in isolated areas of low density, demand may not justify a network of fixed routes within walking distance of all parts of the area. In such cases dial-a-ride and park-and-ride may be better solutions.

The suburban communities served by the HSR were examined for identification of the most promising areas for further service studies of the dial-a-ride and park-and-ride concepts. This examination was based on experience gained in other locations in Canada and appropriate criteria.

The conclusions and recommendations with respect to dial-a-ride and park-and-ride follow. Reference should be made to Exhibit 1 for the locations described.

- . The suburban area in the Hamilton region with the greatest potential for dial-a-ride is Dundas. It is recommended that service studies leading to a demonstration project in this community be undertaken.
- . Other areas examined for dial-a-ride service included:

The Mountain, north of Mohawk Road
Vincent/Red Hill Neighbourhoods
Stoney Creek/Saltfleet
Built up areas east of Highway 20

None of these areas had as good a potential as Dundas for a successful dial-a-ride demonstration project.

- . Service studies should be carried out leading to a park-and-ride demonstration project at the western City Limits. The closed supermarket lot at the junction of Highways 2 and 8 would be a suitable location which could be adapted for this purpose at minimal capital cost. If the demonstration proved successful, then adjacent Hydro rights-of-way could be developed as park-and-ride lots. Express bus services from these sites to the CBD should be provided.
- . Service studies should be carried out for a park-and-ride demonstration project serving the Mountain. The closed supermarket lots at the junctions of Fennell and Upper Wentworth and at Fennell and Upper Gage would be suitable locations which could be adapted for this purpose at minimal capital cost. Express bus services from these sites to the CBD and the Industrial Area should be considered.
- . In the east end a suitable park-and-ride site should be sought on the parking lots of the commercial plazas along Queenston Road between Highway 20 and Nash Road. If a lot can be secured then a service study leading to a demonstration project should be carried out.
- . If the above park-and-ride demonstration projects prove successful, then consideration should be given to the construction of a park-and-ride lot on the open space north of King Street between Potruff Road and the Red Hill Creek. Development of this site would cost at least \$60,000.

PARK-AND-RIDE

Park-and-ride requires the establishment of a parking lot at a convenient point where the car can be left and the journey completed by bus. The greatest potential for park-and-ride exists where the connecting bus route is an express service so that journey time is close to that possible by car; parking should also be free or substantially lower than that available at the final destination.

There should be sufficient riders from the parking lot to allow at least two departures during the peak hour, i.e. at least 100 passengers. This will assure the user of a choice of departures for both the inbound and return journeys.

In addition to park-and-ride users, other passengers can be driven to the terminal and dropped off. For the return journey, short-term parking should be provided for cars waiting for riders returning on the bus.

Park-and-ride service would obviously be most attractive to those trips oriented to the Hamilton CBD. Good prospects for park-and-ride exist at the following locations:

On the Mountain

East of Red Hill Creek

At the Western City Limits

On The Mountain

The closed supermarket parking lots at Fennell and Upper Wentworth and Fennell and Upper Gage each offer about 125 spaces on lots which are already paved. A minimum capital expenditure would be required to set up a demonstration project using these lots.

The location of the Fennell/Upper Wentworth lot is central on the Mountain with good access from both Kennell and Upper Wentworth. The site is presently served by the Fennell and Upper Wentworth routes. It is proposed that two express buses be operated from the lot to the CBD during the morning peak. Service during the rest of the day and for the return journey can be provided by the regular Upper Wentworth service which operates at 10-minute headway during the peak and 15-minute headway during the off-peak.

Running time by express would be about 10 minutes and by local services 12 to 17 minutes.

The lot at Fennell and Upper Gage would be well located for services to the Industrial Area. The Fennell service would provide direct trips to the Greater Hamilton Shopping Centre and the Industrial Area along Burlington Street. A trial of express service from the Mountain to the Industrial Area would logically be based on this lot.

It is not clear under what terms these lots could be made available for a park-and-ride demonstration project. It seems likely that the sites will eventually be developed, but it should be possible to put them to use for this purpose until this happens.

East Of Red Hill Creek

East of the Red Hill Creek, a park-and-ride lot, for about 125 cars, could be established on open space north of King Street between the Red Hill Creek and Potruff Road. This point would be convenient to the residents of the Vincent and Red Hill neighbourhoods as well as Stoney Creek and areas to the east and south. The lot would cost a minimum of \$60,000 to develop for park-and-ride.

If served by express services to and from the CBD, running time would be about 20 minutes compared with between 22 and 26 minutes by the regular Delaware service.

Since the capital cost of developing park-and-ride at this point is high, it is not recommended for immediate examination. It would be prudent to wait for results of other park-and-ride experiments which can be carried out with a smaller investment.

There are a number of commercial shopping centres along Queenston Road between Nash Road and Highway 20. It appears that these are not used to capacity during the week and it may be possible to use them for a demonstration project. It is recommended that the owners of these centres be approached to determine if space could be made available for a test. Parking for at least 100 cars should be secured at one point.

Western City Limits

At the western City Limits, a closed supermarket lot at the junction of Highways 2 and 8 would be a suitable site for park-and-ride. Accommodation for about 125 cars at minimal expenditure is available. Express service from that point could be provided by the Dundas service operating from that point as an express service. The Delaware Main West would serve the lot outside peak hours. Express service to the CBD would take 10 minutes compared to between 11 and 14 minutes by the local services.

A large park-and-ride lot could be developed on the Hydro right-of-way which crosses Main Street just east of the City Limits. If the demonstration project proves successful, then consideration should be given to expenditure on the development of the right-of-way as a park-and-ride lot.

DIAL-A-RIDE

Dial-a-ride is a local service which collects passengers from a specific area at their homes in response to a telephone call and delivers them to a transit terminal or a major attractor such as a shopping centre. The service is usually provided with a small, 11 to 22-seat, vehicle which can circulate through the area and be filled during a 15 to 20-minute pick-up cycle. Distribution from the terminal or attractor is offered on the return journey.

Dial-a-ride offers doorstep convenience to a passenger at a cost which is closer to a bus fare than a taxi fare. With appropriate conditions, the dial-a-ride will attract more passengers than a fixed route system and may cost the community less in terms of net operating deficit. The likely success of dial-a-ride depends upon criteria described later.

Ideally the dial-a-ride service would connect with an express service or a frequent bus service on a main route which can compete favourably in time and cost with travel by car. It is also desirable that the dial-a-ride connect to the bus route at or near a major focal point such as a shopping centre so as to generate trips for a number of purposes throughout the day.

Dial-a-ride can be either many-to-one, serving many origins or homes to one destination such as a transit terminal, or it can be many-to-many, providing trips from many origins to many destinations. The many-to-one is, of course, the simplest form and is relatively easy to schedule. The many-to-many is more in the nature of a taxi service and requires more complex scheduling of vehicles possibly by computer. At least initially, dial-a-ride service should be many-to-one.

Dial-a-ride service should be conceived in the context of supplementing other existing and proposed transit services in an urban area. In general terms, there should be an adequate population with the desire and motivation to use transit for a reasonable number of trips.

Criteria

The following criteria can be used to determine which areas may be suitable for dial-a-ride service. Where areas meet many of the criteria, then detailed service studies should be instituted in order to establish the demand, operating methods and costs for serving the area. Appropriate questionnaires should be directed to the residents and public meetings held in the area to ascertain their interest, that they would be prepared to pay realistic fares and that there would be sufficient patronage of the system.

The criteria suggested for application in the Hamilton region are:

1. Population

5,000 to 15,000 people in a low density suburban community.

2. Accessibility

The area should allow the collection of passengers on a maximum 25-minute circuit. Longer collection times would involve the first passenger picked up in an objectionably long journey. Speeds of 10 mph are usual because of frequent stops to pick-up or discharge passengers.

3. Isolation Of Service Area

The service area should be a separate community with 50% to 100% of the area perimeter well defined with geographic or physical boundaries. Service would normally be offered

to the whole of an identifiable community rather than to a selected portion within a larger suburban area.

The community should have only one focal point for major activities and mainline transit.

4. Street Network

The local street system should be discontinuous and less than 50% of the service area should lie within quarter-mile of major arterial streets. If this is not the case, fixed route service may be more appropriate.

5. Traffic Potential

There should be potential for traffic growth to about 200 passengers in the peak hour. Allowing 5 buses, 20 passengers per bus on a 30-minute cycle gives 200 passengers per hour. This volume is required to make good use of a dispatcher. Potential for growth of service to 6-10 buses is desirable.

Traffic above this level indicates a fixed route system may be warranted.

6. Public Interest

The public should show a desire for dial-a-ride service in their area. At least 80 peak period trips should be committed by the public.

7. Service Improvement

Dial-a-ride should provide an improvement over the existing transit services.

8. Strong Final Destination

There should be a common final destination for trips from the area being considered. Trips should not be dispersed in a number of directions, but should flow to and from one major point. The residents of the area should have a high percentage of employment at this destination.

9. Connecting Trunk Route

The dial-a-ride should serve a single terminal on a major trunk route giving connection to a major final destination. This trunk route should provide a service which is competitive in time and cost with that of a trip by private car. An expressway connection to the CBD would be most favourable.

Table 1 gives the general range for rating the criteria under headings: *Excellent, Good and Poor.*

A number of areas were examined for the application of dial-a-ride service. These areas are shown on the attached plan and listed below:

Mountain, South of Mohawk Road
Vincent/Red Hill Neighbourhoods
Stoney Creek/Saltfleet
Built-up areas east of Highway 20
Dundas

Each area was rated according to how the area fits the criteria. Information on all criteria was not available within the scope of this study, but would require an intensive service analysis and survey of the residents to develop.

TABLE 1
RANGE FOR RATING CRITERIA

<u>CRITERIA</u>	<u>EXCELLENT</u>	<u>GOOD</u>	<u>POOR</u>
Population	5,000 - 15,000	15,000 - 20,000	Below 5,000 and above 20,000
Accessibility	15-25-minute cycle	25-35-minute cycle	Over 35-minute cycle
Isolation	Perimeter well defined	50% of perimeter well defined	Part of a larger area
Street Network	Discontinuous local street remote from arterial street.	Approx. 50% of service area within $\frac{1}{4}$ -mile of arterial street.	Most of residential area within $\frac{1}{4}$ -mile of arterial street.
Traffic Potential	150-250 passengers per hour.	100-150, 250-400 passengers per hour.	Below 100 and above 400 passengers per hour.
Public Interest	Strong support and interest shown. 100 peak period trips promised.	Some support and interest shown. 80 peak period trips promised.	No interest shown. Low number of trips promised.
Service Improvement	No existing service.	Infrequent existing service.	Good existing service.
Strong Destination	Strong CBD with high employment from area.	Good CBD with moderate employment from the area.	No CBD with little employment from the area.
Trunk Route	Expressway	Good arterial roads	Poor access

Rating sheets for each area are attached.

The trip potential for each area examined is unknown at the present time. An estimate can be made using trip generation experienced or forecast for other dial-a-ride systems, but this estimate should be used with caution until more accurate projections can be made.

Trip generation figures are:

Regina	:	0.06 per capita per weekday
Bay Ridges	:	0.03 per capita per weekday
Ottawa	:	0.15 per capita per weekday

Recommended Area

Dundas has been identified as the area with the best potential for dial-a-ride. It is recommended that service planning, including a survey of the residents, be carried out in Dundas with a view to initiating a dial-a-ride demonstration project.

Dundas meets many of the criteria for dial-a-ride. Population and accessibility times are in the correct range. The size of the service area can be adjusted by selecting a number of well defined districts. The geography of the town has created a number of residential pockets which are likely to be more economically served by dial-a-ride than by conventional public transit.

Other Areas Examined

Dundas is considered to have the greatest potential for successful dial-a-ride service. General comments on the other areas examined are as follows:

Mountain, South of Mohawk

This is a large, poorly defined area which is undergoing rapid development. Major roads are laid out in a grid pattern lending themselves to a good fixed route system. Present bus service to much of the area is excellent. Future development of the area can be expected to eventually result in a population beyond economic size for a dial-a-ride system. The poor definition of the area can lead to difficulties in drawing the boundaries of the service area.

Vincent/Red Hill Neighbourhoods

The Vincent/Red Hill Neighbourhoods form a well defined self-contained district. Present population is in the right range for dial-a-ride, but future population can be expected to exceed the proper demand. Development is relatively dense and the road system will allow a good fixed route system with good accessibility for the majority of the residents.

Stoney Creek/Saltfleet

This area is of about the right population for a dial-a-ride service. The arterial road system lends itself to conventional fixed route systems. Stoney Creek may be considered as second choice for a dial-a-ride demonstration project.

Built-up Areas East Of Highway 20

The built-up areas east of Highway 20 in their present stage of development are difficult to serve by fixed route systems. Nevertheless, many areas are already developed to high density and it is unlikely that an economical dial-a-ride system could be introduced.

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: DUNDAS

No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	8500	*		
2	Accessibility	20 min.	*		
3	Isolation	Well-defined perimeters	*		
4	Street Network	Residential No through arterials	*		
5	Traffic Potential	Unknown			
6	Public Interest	Unknown			
7	Service Improvement	No local service	*		
8	Stop Destination	Unknown			
9	Trunk Route	Arterial roads		*	

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: Stoney Creek / Saltfleet

No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	13 300	*		
2	Accessibility	25 min	*		
3	Isolation	30 % perimeter well defined			*
4	Street Network	75% within 1/4 mile of arterial			*
5	Traffic Potential	Unknown			
6	Public Interest	Unknown			
7	Service Improvement	Fair existing services		*	
8	Strong Destination	CBD Shopping centres Industrial		*	
9	Trunk Route	Arterial roads		*	

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: East of Highway No. 20

No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	3000			*
2	Accessibility	20 min.	*		
3	Isolation	25% of perimeter well defined			*
4	Street Network	75% within 1/4 mile of arterial			*
5	Traffic Potential	Unknown			
6	Public Interest	Unknown			
7	Service Improvement	Fair existing service		*	
8	Strong Destination	Shopping Centres CBD Industrial		*	
9	Trunk Route	Arterial roads		*	

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: Vincent/Red Hill

No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	5000 and growing	*		
2	Accessibility	25 min.	*		
3	Isolation	80% perimeter well defined	*		
4	Street Network	Most within 1/4 mile of arterial			*
5	Traffic Potential	Unknown			
6	Public Interest	Unknown			
7	Service Improvement	Good existing service			*
8	Strong Destination	Diverse			*
9	Trunk Route	Arterial roads		*	

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: Mountain - Daytime Service Area

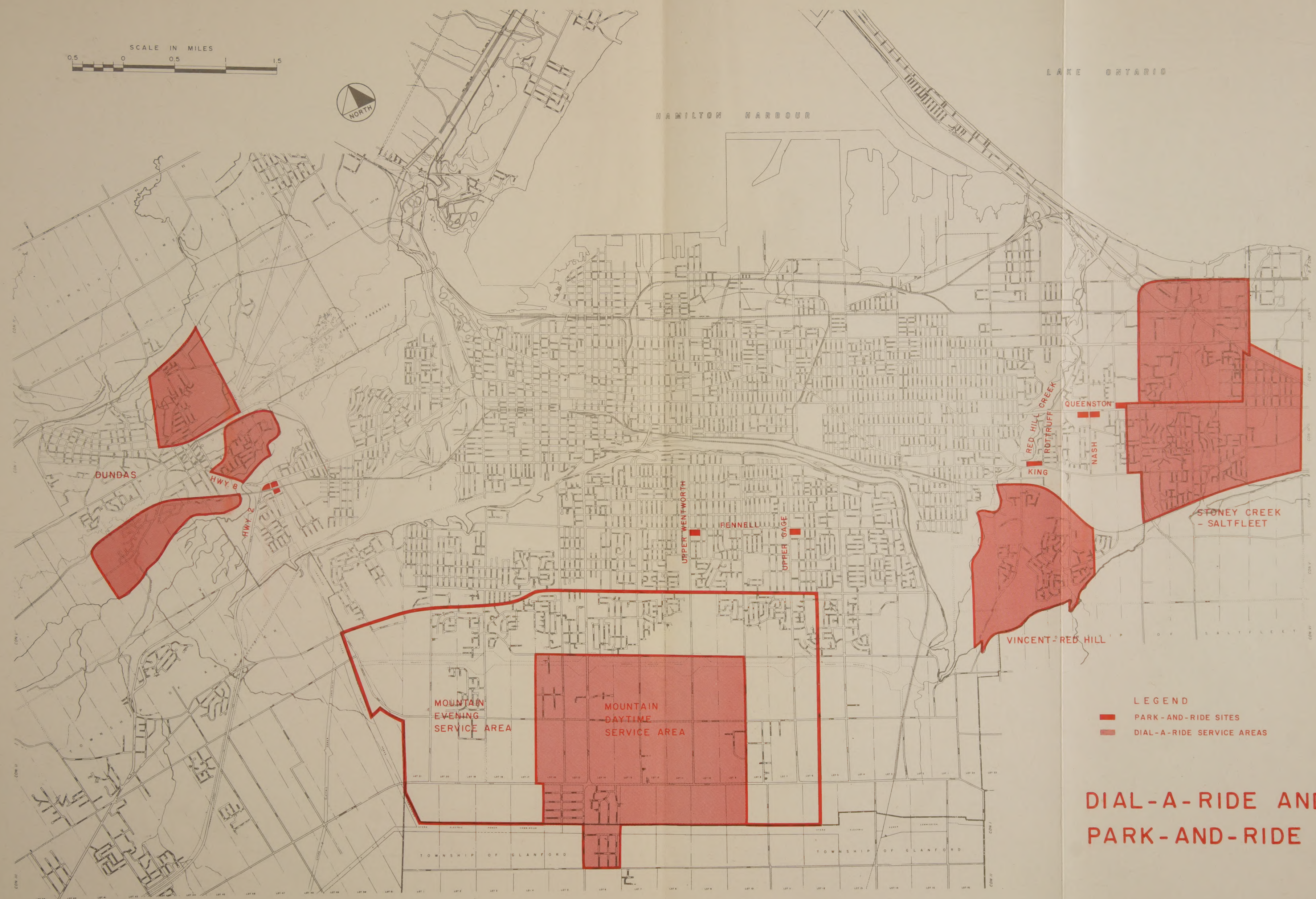
No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	4000			*
2	Accessibility	30 mins.		*	
3	Isolation	Undefined boundary			*
4	Street Network	70% within $\frac{1}{4}$ mile of arterial			*
5	Traffic Potential	Unknown			
6	Public Interest	Unknown			
7	Service Improvement	Good existing service.			*
8	Strong Destination	CBD	*		
9	Trunk Route	Arterial roads		*	

HAMILTON TRANSIT STUDY

RATING OF DIAL-A-BUS POTENTIAL

AREA: Mountain-Evening Service Area

No.	CRITERIA	CHARACTERISTIC OF AREA	RATING		
			1 Excellent	2 Good	3 Poor
1	POPULATION	25,000			*
2	Accessibility	40 mins.			*
3	Isolation	Undefined boundary			*
4	Street Network	80% within 1/4 mile of arterial			*
5	Traffic Potential	Unknown	—	—	—
6	Public Interest	Unknown	—	—	—
7	Service Improvement	Good existing service to majority of residents			*
8	Strong Destination	Local trips in evening, some CBD		*	
9	Trunk Route	Arterial roads		*	



DIAL-A-RIDE AND PARK-AND-RIDE AREAS

HAMILTON PUBLIC LIBRARY



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